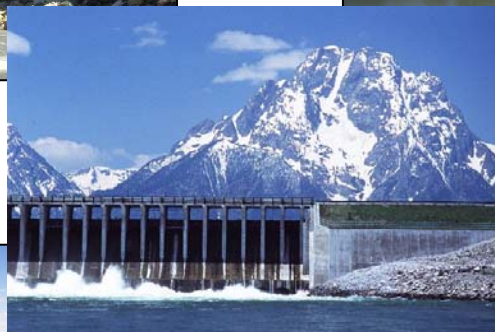




Advanced Hydrologic Prediction Service Quarterly Report 2nd Quarter FY 2009



March 31, 2009

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Collaborative Research

On-going Competitive and Collaborative Research

(Grants and CREST)

Theme: Innovation

Management Lead: Pedro J. Restrepo

Objective: Coordinate the evaluation and management of the collaborative grants program

Milestones

Task	Due Date	Status
On-going competitive grants- Renewal	March 2006	Completed

Accomplishments/Actions

1st Quarter FY05

- We received 27 pre-proposals for new competitive grants. There was no money in the budget to award new grants. All proposers were notified and the process terminated.
- We received progress reports from 3 of the 4 on-going competitive grants. As of today, we also hosted a seminar on the research grant from the U. of Arizona. We will be hosting seminars from the U. of Colorado, U. of Iowa and Central Florida University on Monday, February 7.
- We received a proposal for continuation of a collaborative research from Shripad Deo at CIRA. We requested a re-scope of the proposal which was received and is being evaluated

2nd Quarter FY05

- All progress reports for the on-going competitive grants were received and the renewal process was complete and delivered to the Office of Grants.
- We received news of a Congressional earmark for the Red River Basin Institute. The RFA was published one week ago, and in a telephone conversation with the Institute Director (Chuck Fritz) he communicated that he was completing the proposal this afternoon (4/22)

3rd Quarter FY05

- All on-going competitive grants were submitted on-time to the Grants office.
- The non-competitive Red River earmark grant was received by the proponent on-time. OHD evaluated the grant with assistance of two outside reviewers, approved and forwarded the material to the grants office on time.

4th Quarter FY05

- All grants were awarded on time

1st Quarter FY06

- Scheduled presentations for the Grant Principal Investigators to present their annual progress reports

2nd Quarter FY06

- All four grantees gave presentations to OHD in January, and submitted progress reports.
- All grants were renewed on-time

3rd Quarter FY06

- We used Water Resources Initiative funding to increase each grant by \$20 K. Additionally, we used \$80K to grant the University of Central Florida a one-year extension to adapt the model to the Pascagoula, MS river, in order to extend the area of forecasting of the LMRFC.

- We dedicated \$93K to fund 2 graduate fellowships. Both fellowships will be managed through the NOAA-CREST program lead by the City College of New York. One of the fellowships will be hosted by a NOAA-CREST institution, and the other one will be available to any graduate program in Water Resources and Hydrology in the US.

4th Quarter FY06

- NOAA-CREST was notified of the award, which allows us to proceed to the announcement, evaluation and award of the two student fellowships.
- The four \$20K extensions to all grantees, and the \$80K extension to UCF were signed.

1st Quarter FY07

- We received 42 proposals for the June Omnibus announcement. The proposals were reviewed for compliance and found four were non-compliant. The remaining proposals are being evaluated by HSMB and external reviewers.
- The 4 on-going research projects are approaching their completion. Their third and final seminar presentation is scheduled for February 16. These projects are:
 - University of Colorado: "Improving Operational Streamflow Forecasts in the Colorado River Basin" PI Andrew Slater.
 - University of Arizona: "Parameterization and Parameter Estimation of Distributed Models for Flash Flood and River Prediction with Quantification of Uncertainty" PI Hoshin Gupta.
 - University of Iowa: "Diagnostic Verification of 6-90 Day Ensemble Streamflow Predictions for AHPS" PI Allen Bradley
 - University of Central Florida: "Tides and Waves for the National Service River Forecast System" PI Scott Hagen

2nd Quarter FY07

- Recommended one proposal for award in the Social Sciences category of the December 27 2006 Federal Register Omnibus announcement. No proposals were deemed suitable for funding in the River Regulation category.
- The 40+ proposals received in response to the June Omnibus announcement are in final review. The panel should meet on 4/20

3rd Quarter FY07

- OHD recommended 3 proposals for award under the June 2006 Omnibus announcement. We also received a proposal under the Broad Agency Announcement which we recommended for award.
- All proposals are now in the grants office. Two proposals are now finalized by the Grants office, and the remainder are in progress.

4th Quarter FY07

- All 3 grants received under the June 2006 and one grant received under the December 2006 Omnibus announcements and recommended for funding were awarded. The Grants office rejected the proposal received under the Broad Agency Announcement, by refusing to issue a waiver.

1st Quarter FY08

- The Federal Funding Opportunity Announcement was published in the Federal Register at the end of December. The deadline for the submission of proposals on probabilistic river regulation is 1/28. We expect to convene a panel during the first full week of February and to issue a recommendation to Gary shortly after that.

2nd Quarter FY08

- Two proposals that address the River Regulation problem were recommended for funding. One of the proposals was already awarded, and the other should be awarded soon.

3rd Quarter FY08

- All proposals were awarded. OHD has now 5 on-going collaborative research projects with

UCLA (2), New Mexico Institute of Mining and Technology, Aptima, Hydrologic Research Center; one Congressionally directed soft earmark to Boise State University; 2 matching grants to NOAA-CREST; One student fellowship to the U. of Texas, Austin.

4th Quarter FY08

- Projects are progressing.

1st Quarter FY09

- Received and approved progress reports. Prepared omnibus announcement of the December notice on the Federal Register.

2nd Quarter FY09

- Received 11 proposals for our omnibus announcement. Eight proposals were disqualified from the competition due to administrative non-compliance. The panel met on 3/27 and unanimously recommended one proposal for funding. We are conducting negotiations.

Problems Encountered/Issues

1st Quarter FY05

- Apart from the reduced amount of funding, there have been no problems

2nd Quarter FY05 - None

3rd Quarter FY05 - None

4th Quarter FY05- None

1st Quarter FY06 - None

2nd Quarter FY06 - None

3rd Quarter FY06 - None

4th Quarter FY06

- None on our side. The award to AZ and the \$80K extension to UCF had some glitches that were resolved at the last minute.

1st Quarter FY07 - None

2nd Quarter FY07 – None

3rd Quarter FY07

- The Grants office has an issue with the indirect cost rate (ICR) of the social science proposal. The requested and received clarification about the rate both from the grantee and from DoD, which reviewed and approved the ICR. The Grant specialist is now on leave, returning on 8/8. I'll pursue the question then.
- As of today, we are still waiting on a formal approval from the Grants office about the proposal received under the BAA. We had received verbal approval, but are waiting for a written approval to be attached to the file and finish up that grant.

4th Quarter FY 07

- The proposal received under the BAA was rejected by the Grants office. The Chief had the authority to issue a waiver, but declined to do so. We are studying whether to include it in the December 07 omnibus announcement, or whether to solicit bids for a contract.

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09 - None

Snow Science Plan

Core Goal: Innovation

Management Lead: Mike Smith

Objective: This proposal is meant to address issues raised by the Snow Science Steering Team (SSST) and Eric Anderson. These issues largely revolve around the need for a strategy for snow science directions (See Appendix). In general, NOHRSC and OHD agree that SNODAS and Snow-17 will continue to be used/needed for the foreseeable future. However, a coherent strategy for addressing both common and unique needs is lacking.

Milestones

Task	Due Date	Status
1. Review existing plans and projects; determine snow plan updates	Q3	Work to start in Q3
2.		
3.		
4.		

Accomplishments/Actions

2nd Quarter FY09

- Funding approved

Problems Encountered/Issues

2nd Quarter FY09

- None

Quantify Uncertainty (Ensembles)

eXperimental Ensemble Forecast System (XEFS)

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Jon Roe

Objective: Implement an experimental short-to-long term hydrologic ensemble capability for use by all RFCs and which meets the recommendations provided by the "Design and Gap Analysis" report published May 11, 2007.

Milestones:

Task	FY08 Due Date	Status
XEFS Phase 1 Implementation: Pass OSIP Gate 1	FY09 Q2 (formerly FY08 Q2)	Project planning continued
XEFS Phase 1 Implementation: Pass OSIP Gate 2	FY09 Q3 (formerly FY08 Q3)	Not started
XEFS Phase 1 Implementation: Pass HOSIP Gates 1, 2 and 3	FY09 Q3 (formerly FY08 Q4)	HOSIP project P-2007-019 "Experimental Ensemble Forecast System (XEFS)" in Stage 1
XEFS Phase 1 Implementation: Reconcile differences between prototype and operational Ensemble Post Processor (pass HOSIP Gate 3)	Q2	HOSIP P-2005-005 "Ensemble Post Processor Evaluation" in Stage 3
XEFS Phase 1 Science Algorithm Development: Pass HOSIP Gate 3	Q4	HOSIP P-2006-010 "Hydrologic Ensemble Preprocessor 3" in Stage 1
XEFS Science Infusion	TBD	HOSIP project P-2005-022 "VAR Verification, Validation & Enhancement" in Stage 3

Accomplishments/Actions:

1st Quarter FY08

- Budget discussions continued during this quarter.
- On October 19 HSEB submitted a "High Level Analysis and Design" document to the XEFS Implementation Team for review.
- In December HSEB held a meeting to address feedback received on the XEFS document. However the discussion prompted a re-think of the implementation strategy, which will now be based on Delft-FEWS in light of the CAT recommendation for CHPS.
- The HEP group continued its science discovery activities (these are reported under separate projects).

2nd Quarter FY08

- On January 17 the NOAA Hydrology Program Manager announced his approval of the Community Hydrologic Prediction System (CHPS) Acceleration Team (CAT) recommendation to proceed with implementation of the ready-made Deltares software package "Flood Early Warning System" (FEWS) as the infrastructure solution for CHPS. The draft XEFS software design, based on service-oriented concepts, must be adapted to accommodate FEWS as the infrastructure.
- Hence the XEFS implementation project is now heavily dependent on the CHPS implementation project; Deltares expects to play an important role in this effort later in the CHPS project cycle.
- Meanwhile HSEB began converting HSMB HEP's existing prototype software to the FEWS Pilot environment. The goal is to provide the HEP group with a CHPS environment for familiarization purposes and to facilitate the future ensemble science-to-operations path.
- The XEFS Execution Manager, Chris Dietz, delivered a draft version of the XEFS

Implementation Plan to the XEFS Oversight Group for review and discussion; a final version of the plan is expected in Q3. This plan will provide input for the OSIP Gate 1 project plan.

- HOSIP project P-2007-019 has been delayed (refer to problems/issues below).

3rd Quarter FY08

- Preparation activities continued; some interactions with Deltares took place regarding FEWS capabilities
- Completed and delivered FEWS-based prototypes (EPP2, HMOS, etc.) to HSMB. Training provided. Intention is that HSMB will now continue XEFS prototyping activities in a CHPS environment instead of its alternative software structure.
- Completed port of most NWSRFS long-term ensemble components to CHPS. ESPADP will be more complicated; work will begin next quarter.
- The annual Hydrologic Ensemble Prediction Experiment (HEPEX) conference was held in Delft, Netherlands in June. Deltares continues to collaborate with the NWS on hydrologic ensembles.
- Activities related to ensembles capabilities in CHPS are not scheduled to begin until CY 2009.

4th Quarter FY08

- HSEB modified the NWSRFS climate-based ensembles application (ESPADP) to work with CHPS. This is a BOC requirement until XEFS is implemented.
- Hank Herr of HSEB formed a team and conducted an Ensembles Product Generator (EPG) project kick-off meeting on August 29. The goal is to define requirements for the EPG. Hank has begun the task of gathering all known ideas regarding desired ensemble products for users.
- OHD hosted a visit from Albrecht Weerts (Deltares ensembles focal point) during the week of September 8. Albrecht gave presentations and demonstrations of Delft-FEWS; he also reviewed preliminary plans for CHPS-based ensembles. Albrecht documented details for the CHPS Preparation Workshop #2 at NERFC in September (see status report for Core Goal #13 - CHPS).

1st Quarter FY09

- Deltares initiated routine (bi-weekly) conference calls with OHD to define how the requirements for XEFS map onto the FEWS-based CHPS architecture.

2nd Quarter FY09

- New HSEB Project Area Leader started in January: Mark Fresch
- OHD initiated weekly conference calls with XEFS Planning Team which includes members from Deltares, HSD, CNRFC, NWRFC, HSMB, and HSEB.
- Held planning and design discussions with Deltares. Deltares began implementing framework for EPG.
- EPG: completed draft high-level requirements and started Phase 1 design.
- XEFS EPP3 prototype was partially delivered, and integration into FEWS began.

Problems Encountered/Issues:

1st Quarter FY08 - None

2nd Quarter FY08

- Due to the requirement to implement a CHPS-based XEFS, HSEB in-house resources are necessarily focused on development of an operational CHPS before attention can be paid to an operational XEFS. Consequently, HSEB has only 1 software engineer (Hank Herr) assigned to the XEFS project. Deltares resources will not become available to assist the NWS with hydrologic ensemble forecasting until Q4 FY09. This delays the date of providing an experimental hydrologic forecast capability to all RFCs (as part of CHPS) until mid-2011 when CHPS is deployed. Milestones listed above have been adjusted accordingly.

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09

- Some AHPS due dates will need to be adjusted to reflect realistic schedules.

Gridded Water Resources

Distributed Model - SAC-SMA Parameters

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objective of FY08 work will be to conduct research on usage of SSURGO data and verify whether the use of the data can improve current SAC-SMA parameter estimation and further our distributed modeling. Download data for various projects. Procedures will be developed to store and process the massive data sets.

Milestones

Task	Due Date	Status
1. Obtain high resolution SSURGO and Land Use Land Cover data for DMIP1 basins	Jan. 31, 2005	completed
2. Derive new a priori SAC-SMA parameters using high resolution data for some research basins	March 31, 2005	Completed
3. Review, understand theory of a priori parameter estimation procedure	April 30, 2005	completed
4. Streamline parameter updating (add newly derived data in current grid data sets)	Sept. 30, 2005	Completed
5. Test new parameters against those derived from STATSGO (both for lumped and distributed)	Dec. 31, 2005	In progress
6. Modify, extend theory of SAC-SMA parameter estimation (e.g. use of CN number explicitly)	Sept. 30, 2005	Completed
7. Extend areal coverage of SSURGO-based SAC parameters for more consistent evaluation	Sep. 30, 2006	Derived for DMIP 2 western basins. Derived for 25 states in SR and CBRFC
8. Evaluate performance of SSURGO-based and STATSGO based parameters on soil moisture simulation over DMIP 2 basins where data available.	FY07 Q3 FY09 Q3	In progress
9. Derive and test a priori parameters by using combination of STATSGO and Curve Number Grids	FY07 Q3	complete
10. Complete hydrograph analysis of STATSGO-SSURGO parameters and hydrologic simulations, journal paper and RFC recommendations.	FY08 Q4 FY09 Q3	Analysis completed; paper draft for comments
11. Derive SSURGO parameters for remaining states (including Hawaii, Alaska and Puerto Rico if possible)	FY08 Q4 FY09 Q3	CONUS Complete; Puerto Rico In progress

Accomplishments/Actions

1st Quarter FY05

- Task 1: Most of GIS data for DMIP1 basins are downloaded
- Task 2: Began processing of GIS data to generate SSURGO-based SAC-SMA parameters for IAHS conference

2nd Quarter FY05

- Tasks 2 & 3 have been completed. Fine scale parameters have been derived for some basins in Oklahoma.

3rd Quarter FY05

- Ziya Zhang, Seann Reed, and Victor Koren ran 2km x 2km scale distributed modeling tests with new parameters. Results show improvement over STATSGO based parameters.

4th Quarter FY05

- New version of soil-based SAC-SMA parameters was developed that uses a high resolution CN grid in addition to soil texture. Testing of this new procedure will commence.

1st Quarter FY06

- Began to process data for North Fork American River in CNRFC domain
- Developed basic time estimate to process raw data into parameters.
- OFC Dec 14 on comparison of SSURGO and STATSGO parameters for distributed model simulations. Showed improvement in cases. Gary expressed great interest in the value of these fine scale data for soil moisture simulations.

2nd Quarter FY06

- Mike Smith presented paper on SSURGO and STATSGO data for distributed model simulations at the Joint Federal Interagency Modeling Conference in Reno, Nevada, April 2-6.
- Ziya Zhang's statistical analyses of the distributed modeling simulations shows that the gains by using SSURGO data for parameterization are statistically significant.
- Ziya Zhang investigated methods of automating some of the processing of the raw SSURGO data.

3rd Quarter FY06

- Reviewed an available program to derive STATSGO-based SAC parameters and defined needed changes to develop the program that accounted explicitly for CN grids.
- Provide HL-RMS with Muskingum-Cunge routing option to ABRFC for their testing.
- Continued evaluation of the performance of SSURGO-based and STATSGO-based SAC parameters.

4th Quarter FY06 - N/A

1st Quarter FY07

- This project now leverages the work funded via the Hurricane Supplemental. Significant progress made in streamlining the process of SSURGO data downloading and processing into SAC parameters. New processes use "R" language and GRASS GIS. Validation of new procedures versus initial manual procedures shows generally good agreement.

2nd Quarter FY07

- SSURGO based SAC parameters developed for 20 states in Southern Region and CBRFC domain at 1 and 4km resolutions. Initial comparisons (scatter plots and spatial variability) with STATSGO based parameters show reasonable agreement. HOSIP documents updated to agree with current status of work. Hydrologic modeling analysis of the SSURGO parameters to continue. Intermediate products such as soil porosity were also developed.
- Developed HOSIP documents for this work.

3rd Quarter FY07

- Tested HL-RDHM on 16 basins using different sets of SAC parameters. Began to analyze results. Victor, Seann, Ziya, and Yu discussed use of antecedent soil moisture condition I versus II, decided condition 1 more valid. SSURGO parameters using condition 1 generated for 25 states. Yu revised his journal manuscript on SSURGO-based parameter definition per Seann's and Mike's comments. Yu completed program for filling missing values in parameter grids. Yu regenerated SSURGO parameters for entire states of OR, ID, and WY.
- Continued comparisons of SSURGO and STATSGO parameters using graphs and hydrologic simulations.

4th Quarter FY07

- New parameter grids made available for DHM/RDHM users. The following five files are

available from the NOAA1 server. Please see the attached Word document for instructions on obtaining these grids. The SSURGO parameters have been derived as part of the Hurricane Supplemental tasks.

- 1) unfilled.tgz : SSURGO-NLCD based parameter grids at the 4 km resolution (25 states) and supplemental grids (see README)
 - 2) filled.tgz : SSURGO-NLCD based parameter grids at the 4 km resolution with some gaps filled via interpolation (see the README)
 - 3) statsgo.tgz: STATSGO-GLCC based parameter grids at the 4 km resolution
 - 4) pe_filled.tgz: new monthly PE grids in which data at CONUS boundaries has been extended using interpolation
 - 5) readme.tgz: contains documentation for all the new grids
- Ziya Zhang worked on preparing a journal paper on the analysis of these new parameter sets.
 - Yu Zhang submitted paper to OHD review on the processing of SSURGO-data for the derivation of SAC model parameters.

1st Quarter FY08

- Ziya Zhang ran simulations using new parameter sets on **16** basins, and started results analyses for a journal paper which is under preparation.

2nd Quarter FY08

- Ziya Zhang nearly done with analysis of simulations from SSURGO and STATSGO parameters. HOSIP Stage III plan conditionally approved March. Yu Zhang and Seann Reed helped APRFC derive SAC parameters for Hawaii. Yu provided the processing scripts to APRFC. The RFC gathered the SSURGO data and use land use / land cover data from a local university in the absence of the USGS LULC data. Processing nearly complete: now need to aggregate up to 4km scale. Assessed availability of STATSGO and SSURGO data for Puerto Rico and provided this update to SERFC.

3rd Quarter FY08

- Ziya Zhang has completed the comparison of a priori SAC parameters based on SSURGO and STATSGO soil data and analysis of simulations for 16 selected basins using derived parameters. Draft paper has been finished for group members to comment. Results were presented in Spring AGU (2008) meeting and DOH conference. Ziya Zhang started work with Yu Zhang to derive SSURGO based SAC parameters for the rest of CONUS.

4th Quarter FY08

- Ziya Zhang has downloaded available SSURGO data (as well as land cover data) for the rest of CONUS. Started deriving SSURGO-based a priori SAC parameters.

1st Quarter FY09

- Ziya Zhang derived SSURGO-based a priori SAC parameters for 23 states in the scales of HRAP, half HRAP and a quarter HRAP. The result grids only cover CONUS where data are available so far. Newly derived grids need to be combined with those derived before for the rest of CONUS states.

2nd Quarter FY09

- Ziya Zhang derived SSURGO-based a priori SAC parameters for 23 states and combined with the results for 25 other states after correcting some problems. Applied climate adjustment factors from STATSGO parameters to newly derived SSURGO-based a priori SAC parameters covering CONUS. Filled the missing values from STATSGO-based a priori SAC parameters. A new mask grid is created to tell users whether the value for a specific grid cell is SSURGO-based or STATSGO-based or is water body (as missing values).
- Ziya began work on Puerto Rico SSURGO parameters.

Problems Encountered/Issues

1st Quarter FY05 - None

2nd Quarter FY05 - None

3rd Quarter FY05 - None

4th Quarter FY05 - None

1st Quarter FY06

- Ziya noted that SAC parameters derived from SSURGO data can show discontinuities at county borders.

2nd Quarter FY06 - None

3rd Quarter FY06

- Trying to automate the processing of the SSURGO is challenging due to different formats among counties.

4th Quarter FY06

- Delays due to 1) difficulties in process automation and 2) efforts to launch DMIP 2 western basin experiments. Also, advances in using soil moisture data for model calibration were explored; a new technique for comparing point-to-grid soil moisture estimates was developed in a related study for the economic benefits of water resources. These latter two developments will help the analysis of STATSGO (with variable CN) and SSURGO soil moisture estimates.

1st Quarter FY07

- Identified problem of disk storage of the SSURGO data: much space is required.

2nd Quarter FY07

- FY07 Q1 disk storage problem resolved by processing the SSURGO data state by state.

3rd Quarter FY07 - None

4th Quarter FY07 – Work delayed due to major personnel changes:

- Researcher Ziya Zhang suffering from major health problems; will go on extended leave in October.
- Researcher Yu Zhang left Hydrologic Modeling group to join Hydrometeorology Group. Replacement is being sought.

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08

- Disk space problem has been resolved and 150GB of disk space became available. Final derived SAC parameters may not cover all counties for some states due to the SSURGO data unavailability. These holes can be filled later once the SSURGO data become available

1st Quarter FY09

- Ran out of disk space during the data process. Additional disk space of 100GB was requested. Some of procedures were run twice due to a header error in scripts.

2nd Quarter FY09

- Uncovered a geographic projection problem caused either by HRAP window not being big enough at the beginning (for the case of state Maine) or the initial USGS land cover (1992) as a template was not compatible with 2001 data set (for the case of state Florida). The problem

associated with Florida caused extra work of re-processing previously processed data of 25 states.

- Given the climate adjusted parameters, need to recompute the frequency plots of parameters over CONUS for summary paper.
- Scripts and programs used to derive SSURGO parameters for CONUS didn't apply to Puerto Rico due to HRAP coordinates being limited.
- Discovered that OHD does not have the intermediate data on hand containing soil texture data. These data would be good to have for SAC-HT and future parameterization work.

Distributed Model - Evaluate New Parameter Approaches

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objective will be to evaluate a parameter regionalization approach for SAC and Snow-17 using lumped calibrated parameters. Value of soil moisture data for evaluation and calibration of *a priori* parameters will be also analyzed.

Milestones

Task	Due Date	Status
1. Derive relationships between lumped calibrated SNOW-17 parameters and watershed properties	Mar. 31, 2005	On schedule
2. Generate SNOW-17 parameter grids over Susquehanna River basin	Apr. 30, 2005	On schedule
3. Evaluate and calibrate derived SNOW-17 parameter grids using snow observations and streamflow	Dec. 30, 2005	On schedule
4. Evaluate <i>a priori</i> SAC-SMA parameters over Oklahoma mesonet using runoff and soil moisture data at different spatial scales	Sep. 30, 2005	Completed April 2005
5. Initial evaluation of possibility of using soil moisture data to calibrate <i>a priori</i> SAC-SMA parameters	Sep. 30, 2005	completed
6. Develop a physically-based procedure to derive <i>a priori</i> values of the most critical SNOW-17 parameters over CONUS	Mar 30, 2006	Completed for MF-max, MF-min.
7. Evaluate <i>a priori</i> STATSGO-based SAC parameters over selected regions (e.g., Oklahoma) by comparing to available measurement (e.g., soil moisture, runoff, evaporation)	May 31, 2006	completed
8. Analyze effect of climatological PE on the water balance simulation results, and develop a calibration approach of the spatial adjustment of climatological PE grids. Modify HL-RDHM code to incorporate developed PE calibration approach.	FY08 Q4	completed
9. Test PE adjustment approach on a large region, e.g., Oklahoma Mesonet using soil moisture data.	FY08 Q4	completed
10. Perform calibration of SAC parameters, and analyze their relationships to <i>a priori</i> and climatologic indexes	July 31, 2006 FY08 Q4	completed
11. Test SAC and SNOW-17 derived parameters over uncalibrated areas/basins	FY07 Q1	Snow-17 initial tests of 2 parameters nearly complete. Being done in DMIP2 western basins.
12. Evaluate soil moisture simulations over DMIP2 basins from lumped and distributed models.	FY07 Q3	Completed in Q4 for DMIP 2
13. Extend analysis and tests of a climate adjustment to <i>a priori</i> parameters (increase time period and basins)	Q3 FY09 Q1	complete
14. Compare long-term climatologic variables (precipitation, evapotranspiration) to their averages over shorter test periods, and evaluate effect of their differences on the climate adjustment factors.	Q3 FY09 Q1	Complete
15. Test PE adjustment approach to large region i.e., uncalibrated areas/basins from lumped and distributed simulation results.	Q3 FY09 Q2	In progress Not funded by AHPS for FY09

16. Investigate other sources of Snow-17 <i>a priori</i> parameter ranges: use energy budget model results	FY08 Q4	Complete for MFMAX and MFMIN
17. Derive and test first-cut <i>a priori</i> values of Snow-17 parameters SCF and UADJ	FY08 Q2 FY08 Q4	Monthly values derived for CONUS; move completion date
18. Evaluate new ZPERC algorithm, provide recommendations to RFCs. Deliver new ZPERC grid via CAP	FY08 Q4 FY09 Q1	ZPERC completed; delivery In progress
19.		

Accomplishments/Actions

1st Quarter FY05

- Task 1: Similar analysis was performed for Cont-API model
- Task 4: Runoff and soil moisture data for the Oklahoma mesonet region are collected.

2nd Quarter FY05

- Task 1. Basic relationships developed.
- Task 2, 3. Completed. Fekadu Moreda and Zhengtao Cui delivered distributed model and all parameter grids to MARFC. Fekadu presented paper on this work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.
- Task 4. Ziya Zhang has acquired and processed fine scale soils data for the Oklahoma areas. Victor completed this task and presented work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.

3rd Quarter FY05

- Victor and Fekadu tested the distributed model for a multiyear period over the OK. Mesonet domain to evaluate against soil moisture estimates from the NLDAS project run by NCEP.

4th Quarter FY05

- Victor extended the analysis of Oklahoma Mesonet simulation results. Developed climate adjustment factor to modify the existing a-priori parameters. A grid of these adjustment factors was developed for CONUS. Testing with OK Mesonet soil moisture justifies again the physics of the modified SAC-SMA model. Hypothesis is that the climate index can improve a-priori parameter identification and thus simplify the calibration of distributed and other models.

1st Quarter FY06

- Developed CONUS data set of *a priori* parameters for Snow-17 based on Eric Andersons initial suggestions.

2nd Quarter FY06

- Ongoing work on evaluation and calibration Sacramento parameters over Oklahoma region and 20 selected river basins. Distributed and lumped approaches are used in these tests. Tests of climate adjustments are ongoing.

3rd Quarter FY06

- Published two papers (IAHS Red Book) on evaluation of *a priori* SAC parameters over the Oklahoma mesonet region.
- Extended analysis of *a priori* parameter performance over Oklahoma mesonet basins for lumped-based simulations using runoff and soil moisture measurements.
- Soil moisture measurements were incorporated into the automatic calibration process as an additional performance measure. Preliminary results suggest that the use of soil moisture data can improve a parameter estimation procedure and reliability of model parameters. They are also helpful in manual calibration to be sure that 'good results are achieved for scientifically sound reasons'.

4th Quarter FY06

- More soil moisture tests were performed at 2 New Mexico sites. These tests led to development of an approach that allowed rescaling of soil moisture states simulated using HRAP scale *a priori* parameters into point soil moisture states by using local soil properties (porosity and wilting point). It has potential for simulation/prediction of soil moisture at a local scale. However, wide range tests need to be performed.

1st Quarter FY07

- SAC-HT: Additional soil moisture tests conducted at the request of New Mexico State researchers (for the Economics Study of the NOAA Water Resources program). The developed approach to rescale soil moisture states simulated using HRAP-scale *a priori* parameters into point soil moisture states by using local soil properties was tested for 48 Oklahoma Mesonet soil measurement sites. These simulations show much higher accuracy at Mesonet sites comparing to just use of HRAP-scale *a priori* parameters without rescaling. This shows promise for end-users to get site-specific soil moisture information during coarse-scale (i.e., 4km grid) executions of the SAC-HT model. End-users can obtain local soil properties from field-collected soil samples or perhaps SSURGO data would be useable.
- Snow-17: Developed CONUS estimates of MF-MAX, MF-MIN using Eric Anderson's recommended ranges modified by topographic attributes such as aspect and forest cover. Delivered estimates to CBRFC. Began testing parameters for selected areas in the Juniata River basin (MARFC).

2nd Quarter FY07

- Developed CONUS Sacramento model parameters from STATSGO data and variable NRCS Curve Number (CN). Parameters developed at 1km and 4km scale. Developed parameters for Maryland to support Baltimore Flash Flood Project with DHM-TF. Began initial evaluation of the STATSGO parameters with/without variable CN.
- Obtained calibrated SNOW-17 parameters of several basins from ED Clark (CBRFC). Started comparing these parameters with *a priori* Snow-17 parameters.
- Updated HOSIP documents to reflect the current status of these tasks.
- Investigators at U. New Mexico report 'promising' results using Victor's soil moisture simulations for an agricultural economics study. Draft journal paper being prepared.

3rd Quarter FY07

- Victor Koren performed analyses and prepared presentation on the use of soil moisture observations for calibration for IUGG conference in Italy, July 2007.
- Reviewed draft report from U. New Mexico: "Exploratory Case Study on the Value of Improving Soil Moisture Forecast Information for Rangeland Management" which showed the value of soil moisture data from the SAC-HT model.

4th Quarter FY07

- Victor completed analysis of using soil moisture data to aid model calibration. Victor developed paper from July IUGG conference and submitted to Journal of Hydrology for publication. Results showed that more consistent SAC model parameters can be developed when using additional data for calibration (not just basin outlet streamflow)
- Received request to provide CONUS 1/8 degree scale SAC parameters for NCEP's North American Land Data Assimilation System (NLDAS) project. This will provide more independent testing and evaluation of the soils-based parameters at a national scale.
- Began testing of *a priori* Snow-17 parameters in western DMIP 2 basins.
- Completed analysis of distributed model soil moisture simulations for DMIP 2. Presented results at DMIP 2 workshop September 10-12, 2007.

1st Quarter FY08

- Evaluated *a priori* grids of MFMAX and MFMIN over DMIP2 basins.
- Processed CONUS-wide NARR wind data and generated monthly climatological grids. A preliminary HRAP grid of UADJ parameter was generated using these climatological grids.

2nd Quarter FY08

- Developed new approach to derive ZPERC SAC parameter from infiltration theory and first principles. Delivered SAC and SNOW-17 parameters for DMIP 2 western basins to NASA for testing in the NASA Land Information System. Monthly UADJ and SCF grids (October through June) have been created for CONUS. They are under evaluation. Used simplified energy-budget snow model equations to derive another set of MFMAX and MFMIN parameters for CONUS: evaluation underway.

3rd Quarter FY08

- Obtained DEM and forest grid to start investigation on a snow-17 parameterization for Alaska
- Completed MFMAX and MFMIN parameters for CONUS with simplified energy-budget snow model and Naoki Mizukami presented the methodology in National DOH conference. The parameter grids were also created at 1/2 hrap for mountainous regions. Evaluation still underway.

4th Quarter FY08

- Completed the first phase of climate adjustment to a priori PE and SAC-HT parameters. Technical note on this analysis is close to finish. The next step will be application of the adjustment to regional/CONUS a priori grids and testing in lumped and distributed modes.
- Completed preliminary MFMAX and MFMIN grids for Alaska using simplified energy budget model. Next step, ratio of MFMIN to MFMAX needs to be evaluated to refine parameter values for Alaska and possibly for CONUS.

1st Quarter FY09

- Prepared a Technical note of the first phase of climate adjustment to a priori PE and SAC-HT parameters. Generated CONUS grids of adjusted UZTWM and LZTWM parameters. Started tests of the climate adjusted parameters.
- Victor presented his lumped model results with newly derived climate adjusted parameters in dry areas. Presentations made to RFCs and OHD.
- Modified the melt factor parameterization methodology (aforementioned as energy-budget based temperature index model) based on the results of observed snow data analysis. Recomputed MFMAX and MFMIN parameter grids for CONUS (1 hrap, ½ hrap, ¼ hrap) and Alaska (1 hrap). Naoki Mizukami presented the methodology and evaluation in AGU conference. Computed monthly UADJ parameter grid for Alaska.

2nd Quarter FY09

- Revised energy-budget based temperature index model based on documents obtained from Russia. Recomputed MFMAX and MFMIN over CONUS and Alaska based on the revised model. Recomputed UADJ with winter month average wind for CONUS and Alaska. Extend the grid domain to Canadian portion of RFCs. Started evaluation (comparison with lumped parameter, sensitivity tests).

Problems Encountered/Issues

1st Quarter FY05 - None

2nd Quarter FY05 – None

3rd Quarter FY05 – None

4th Quarter FY05 - None

1st Quarter FY06 – None

2nd Quarter FY06 - None

3rd Quarter FY06 - None

4th Quarter FY06

- Planned work delayed to work on SnowMIP and New Mexico soil moisture simulations to support Water Resources Economics study. However, the use of soil moisture in the auto-calibration process and a technique of relating point-to-grid soil textures from the New Mexico work will lead to better calibrated parameters to use in the analysis of a climatological adjustment.

1st Quarter FY07

- Delays again due to additional tests requested by the New Mexico Economics study.

2nd Quarter FY07 - None

3rd Quarter FY07

- Hydro group currently managing over 30 projects; OHD prioritization needed to reduce workload.

4th Quarter FY07

- PE adjustment of parameters delayed due to Cold Regions workshop, DMIP 2 gridded data derivation for FY07 OHD AOP item, results analysis, preparation of OHD Science Plan, and other projects.
- Fekadu Moreda leaving Hydrologic Modeling Group to join River Mechanics group. Fekadu worked on the *a priori* estimates of the Snow-17 parameters. Replacement won't start until November 13, 2007

1st Quarter FY08 - None

2nd Quarter FY08

- Testing of *a priori* Snow-17 parameters SCF and UADJ delayed due to group turnover and need to analyze DMIP 2 precipitation data sets for HMT testing.

3rd Quarter FY08 - None.

4th Quarter FY08 - None

1st Quarter FY09 – None

2nd Quarter FY09 - None

Snow Model - Plans for using SNODAS Output

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Michael Smith

Objective: Develop plan and approach to use SNODAS output to generate run-time modifications to Snow-17 in operational setting.

Milestones

Task	Due Date	Status
1. Review existing Snow-17 modifications	May 2006	completed
2. Familiarization with SNODAS processes and products	July 2006	Complete
3. Devise approach	Aug 2006	Draft plan delivered 9/06
4. Acquire data & write draft code	Sept 2006	On hold
5. Test approach.	Nov 2006	On hold
6. Allocate funding for 4 months (\$50K) for a contractor to support the SSST. Locate contractor	FY08 Q3	On hold
7. Support SSST by developing draft plan	Q4	

Accomplishments/Actions

1st Quarter FY06

- No work this period

2nd Quarter FY06

- Developed draft outline of tasks and approach (no. 3 above), gave to Eric for comment after his return to Virginia in March.

3rd Quarter FY06

- Eric Anderson began in-depth planning of project; began coordinating with NOHRSC on details of data and SNODAS model outputs. Eric completed the review of run-time mods such as those with AESC.

4th Quarter FY06

- Eric completed draft plan. Sent to OHD for review. Final plan will be submitted in October 2006.

1st Quarter FY07

- AHPS funding of \$38K approved for HL portion of this work.

2nd Quarter FY07

- The Snow Science Steering Team needs to approve this project

3rd Quarter FY07

- The Snow Science Steering Team needs to approve this project. Discussions at the August Cold Regions workshop may lead to a plan or decision for this work.

4th Quarter FY07

- This project was briefly discussed at the Cold Regions Hydrology (CRH) Workshop in August. No word yet on the actions to be taken from the CRH workshop.

1st Quarter FY08

- Need approval from the Snow Science Steering Team prior to continuing the project

2nd Quarter FY08

- Determined that OHD needs to develop a more concise plan for the direction of the NWS Snow Hydrology program

3rd Quarter FY08

- See issues

4th Quarter FY08

- See 'issues' section.

1st Quarter FY09

- Mike prepared FY09 AHPS plan based on Eric Anderson's recommendations. Submitted plan to the AHPS/Water Resources Innovation Theme team for consideration. Sent AHPS plan to Don Cline to keep him in loop.

2nd Quarter FY09

- AHPS funding for this project appears likely.

Problems Encountered/Issues**1st Quarter FY06**

- No work started as Eric was finishing Snow-17 coding changes and final documentation. Also, the AHPS funding amounts weren't finalized.

2nd Quarter FY06 - None**3rd Quarter FY06 - None****4th Quarter FY06**

- Snow Science Steering Team created to provide overall direction. This project is included in the list of all OHD, NWS. NOHRSC plans for coordination. Data needed for this project is not available will have to be generated via 'Re-analysis' at NOHRSC; may be a large effort. (note: AHPS SLF Theme Team assigned this item a fairly high priority.)

1st Quarter FY07

- The Snow Science Steering Team needs to approve this project.

2nd Quarter FY07

- The Snow Science Steering Team needs to approve this project

3rd Quarter FY07

- The Snow Science Steering Team needs to approve this project

4th Quarter FY07

- The Snow Science Steering Team needs to approve this project

1st Quarter FY08

- Need approval from the Snow Science Steering Team prior to continuing the project

2nd Quarter FY08

- Determined that OHD needs to develop a more concise plan for the direction of the NWS Snow Hydrology program

3rd Quarter FY08

- SSST has not acted on Eric Anderson's emails and recommendations.

4th Quarter FY08

- SSST has not acted on Eric Anderson's emails and recommendations. Mike will re-submit this plan for FY09.

1st Quarter FY09

- None

2nd Quarter FY09 - None

Auto Calibration for Distributed Model

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objectives of this work include developing tools and procedures for auto-calibrating the RDHM to generate parameters for the AWIPS DHM delivered in OB7.2. Two phases are identified for this area of research. First, initial work will focus on auto-optimization of the scalar multipliers of all the gridded parameters (SAC, Snow-17, and routing) so that all parameters are adjusted uniformly. This was done manually in DMIP 1 with good success. A prerequisite for this work is the development of sound lumped hourly parameters. Second, future funding will support work to optimize individual gridded parameters for groups of grids. FY07 work dovetails with the DMIP 2 and other projects.

Milestones

Task	Due Date	Status
1. Modify RDHM to be called by a generic 'wrapper'	FY07 Q2	complete
2. Test initial auto calibration with OK DMIP 2 basins.	FY07 Q2	complete
3. Explore performance issues in context of DMIP 2	Q4	complete
4. Evaluate multi-time scale objective function. Evaluate need for time series component analysis to identify dominant time scales	FY07 Q2	1 st part complete; 2 nd part delayed
5. Test Rosenbrock and/or Davidon-Fletcher-Powell search algorithms	FY07 Q3	Put on hold
6. Automatic calibration extended to lumped Snow-17	FY08 Q1	Complete
7. Investigated separate procedures for elevation zones for mountainous areas.	FY08 Q4	In progress
8. Evaluate combined automatic and manual calibration strategy	FY08 Q4	Complete for non-snow basins; in progress for basins including snow
9. Develop outline for overall strategy for distributed model calibration	FY08 Q3	In progress
10. Develop approach for auto calibration of elevation zone parameters	FY09 Q1	Plan developed; submitted to AHPS

Accomplishments/Actions

1st Quarter FY07

- Developed initial HL-RDHM 'wrapper' algorithm to test various minimization approaches.

2nd Quarter FY07

- Simple direct search algorithm added to 'wrapper' to find best parameter scalar multipliers. This was tested for DMIP 2 with good success. Rosenbrock search algorithm is being tested now. Additionally, a promising new search algorithm developed in 2006 called Dynamically Dimensioned Search (DDS) was located and the code obtained for use free of charge. Coding advances in HL-RDHM were provided to HSEB.
- Developed HOSIP documents for this project.

3rd Quarter FY07

- HL-RDHM with calibration feature presented to all RFCs at the June distributed modeling workshop at ABRFC. Training provided to workshop participants. Minor bugs corrected and continued streamlining of the procedure achieved.

4th Quarter FY07

- HL-RDHM with calibration feature testing in DMIP 2 Oklahoma basins; showed good performance evidenced by comparing results to other models.
- Paper on use of simplified search algorithm and soil moisture data using multi-time scale objective function prepared.
- Hydro modeling group began Multi-step Automatic Calibration Strategy ('MACS') type calibration procedure combining manual calibration with automatic calibration in an iterative process. This used in DMIP 2.
- Presented multi-time scale objective function to DMIP 2 participants at DMIP 2 workshop; several participants want to use it.
- Field support of RFC use of calibration tool

1st Quarter FY08

- RDHM automatic calibration module was restructured (mostly dealing with parametric data and model states) that led to significant reduction in run time.
- Automatic calibration was extended to SNOW17 operation and tested for DMIP2 basins.
- Created off-line scripts to perform zone adjustment of RDHM parametric grids. This approach was tested for the Carson basin in manual calibration of SAC-SMA and SNOW17 models. Linkage to RDHM software needs to be performed for an automatic option.

2nd Quarter FY08

- Planned work put on hold until strategy for distributed model calibration developed. Mike to develop initial outline.

3rd Quarter FY08

- None

4th Quarter FY08

- Mike and Victor reviewed U. Arizona DMIP 2 journal paper reporting on use of *a priori* parameters, regularization, multi-objective optimization, and spatially-variable parameter adjustment for distributed model calibration. Hydro group will review and make recommendations as part of DMIP 2 results analysis.

1st Quarter FY09

- Victor prepared revised AHPS/Water Resources plan for scaling based on elevation zones or other defined property. Mike presented Victor's plan to the Distributed Modeling Team.
- Evaluated DMIP 2 western basin results. OHD's calibration strategy produced very reasonable results compared to other DMIP 2 participants.

2nd Quarter FY09

- Hydrogroup studied various papers on calibration of distributed models.

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07

- Long HL-RDHM calibration run times noticed. This was solved by adding code from the older HL-RMS to the new version HL-RDHM so that the calibration routines execute a streamlined version of the distributed model.

3rd Quarter FY07 - None

4th Quarter FY07

- Planned activities such as testing the Rosenbrock search procedure delayed due to other

projects' priority.

1st Quarter FY08 - None

2nd Quarter FY08

- Planned work put on hold until strategy for distributed model calibration developed. Mike to develop initial outline.

3rd Quarter FY08

- The development of a strategy for distributed model calibration may need to be coordinated via the to-be-formed Distributed Modeling Investment Team.

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09

- No funding for contractor support provided for FY09.

Distributed Modeling Spatial Display and Analysis Tool (DHM-SDAT)

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Analyze existing display tools for Distributed Hydrologic Modeling.

Milestones

Task	Due Date	Status
1. Coordinate with Distributed Modeling Gap analysis team and the data assimilation work within the XEFS project.	TBD	Team being formed
2. Investigate existing display tools for gridded data to be used in research and in prototype testing.	FY09 Q1	Complete

Accomplishments/Actions

1st Quarter FY08

- Project initiated

2nd Quarter FY08

- Team being formed to perform a survey of existing tools to support distributed modeling spatial display and analysis

3rd Quarter FY08

- Investigated potential for using GrADS visualization software to view DHM-TF output. Software is versatile and performs well, but can only display HRAP output in an interpolated lat/lon view.
- Examined GRASS GIS as a platform for visualizing DHM-TF output. Although featuring a steeper learning curve than GrADS, the software can directly display DHM-TF output on the native HRAP grid, as well as ingest relevant hydrological and geographic shape files.
- This work to be coordinated via the to-be-formed Distributed Model Investment Team

4th Quarter FY08

- Created several GRASS GIS scripts for automated and simple-interactive viewing of DHM-TF output
- Started initial investigation of Google Earth and AWIPS as two possible means of visualizing DHM-TF output data. Investigated CHPS (FEWS) display of gridded information. Configured FEWS to display gridded XMRG time series in GRIB format successfully. However, the configuration for FEWS to display gridded time series in ArcInfo ascii raster format was not successful.

1st Quarter FY09

- Refined GRASS GIS scripts for viewing of DHM-TF data
- Created several Google Earth scripts for automatic generation of KML formatted files necessary for viewing DHM-TF data within Google Earth
- Created Fortran programs which can be used to reformat any gridded or point data into KML format for viewing in Google Earth
- Worked with OHD personnel to obtain in-house XrmgViewer software to view XMRG formatted files. Currently testing software to determine potential usefulness.

2nd Quarter FY09

- Refined Google Earth Fortran conversion programs, making them general enough for use with

most HRAP/XMRG files.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08

- Need to coordinate with investigation of GFE. Mary Mullusky says that personnel associated with GFE are very interested in hydro requirements.

1st Quarter FY09 - None

2nd Quarter FY09

- No FY09 funding for contractor support.

Distributed Model Intercomparison Project (DMIP II)

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Develop then Refine Gridded Water Resources Products.

Milestones

Task	Due Date	Status
1. Complete analysis of simulations from the Oklahoma experiments	Q4	On track
2. Submit papers for DMIP 2 Special Issue	Q4	On track
3. Design OK forecast mode experiment	FY09 Q1	On track
4. DMIP 2 Western Basin Experiments: generate and analyze basic (w/o HMT data) distributed and lumped simulations	FY09 Q1	On track
5. DMIP 2 Western Basin Experiments: HMT QPE, temperature, and freezing level data analysis and use in distributed and lumped models	FY09 Q1	Most likely delayed due to OHD and HMT precipitation problems
6. OHD support for DMIP 2 participants	ongoing	On track

Accomplishments/Actions

1st Quarter FY08

- Completed Western Basins lumped and distributed simulations using HL-RDHM with Snow-17 at one hour time step. Begin to analyze the HMT QPE estimates. Sent out summary of DMIP 1 results in Oklahoma to RFCs and Regions.

2nd Quarter FY08

- Received all final simulations from Ok. participants. Began writing journal papers. OHD Hydromet group performing MPE analysis of NSSL/ESRL 'merged' radar QPE with in situ rain gauge data. Final product will be 'best' QPE from HMT gap filling radar.

3rd Quarter FY08

- Wrote paper for DMIP 2 Special Issue on the overview of the Oklahoma experiments. Began writing the overall results paper. Results confirm that OHD model is very sound.
- OHD co-chaired a session at Spring AGU in Florida on DMIP 2 results. Mike gave invited presentation on OHD distributed modeling.
- OHD tested HMT radar QPE's from the NSSL SmartR and ESRL-XPOL radars from the 2005-2006 period. This effort used MPE to bias-adjust the radar fields using 12 rain gauges. These data sets were successfully run through the OHD distributed model, showing that the proposed method of evaluating the HMT 'gap filling' radar QPEs is valid.
- Mike and Dave Kitzmiller attended annual HMT workshops in Sacramento.
- Ezio Todini from Italy and U. Arizona will submit western basin simulations.

4th Quarter FY08

- Ezio Todini from Italy submitted western basin simulations.
- Mike presented Oklahoma and Western basin results at July DOH conference.
- Mike and Hydro-group writing the overall results journal paper for the Oklahoma experiments.
- Mike coordinated DMIP 2 journal papers for the Journal of Hydrology Special Issue.
- Vrije U. of Brussels will continue their participation with a new PhD student; will develop soil moisture simulations per DMIP 2 modeling instructions and submit them to OHD.

1st Quarter FY09

- Began preliminary evaluation of all participants' simulations for western basin experiments. A wide range of performance was noted by the models for the two western basins. The OHD results are very reasonable in comparison.
- Mike prepared presentation on DMIP 2 results for AMS conference session on 'Comparison of Distributed Models'. Mike will also chair the session.
- Provided reviews and Guest Editor comments on several DMIP 2 journal papers.
- Mike continued to write the overall results paper for the Oklahoma experiments
- Mike and student of Ezio Todini from Italy discussed their modeling approaches.

2nd Quarter FY09

- Hydro and Hydromet groups in OHD developed plan to use the calibration MAP preprocessor and MPE to generate gridded QPE fields as a second approach. The MAP preprocessor was modified to output complete hourly time series of precipitation at NCDC and Snotel sites. Initial testing of these point time series shows promise. These data will then be fed into MPE. A small data set consisting of four station data was used for preliminary testing of MPE to generate a gauge-only QPE field.
- Work began in earnest to fix the previous QPE derivation problems and generate a new data set in the west. Initial delivery of gridded QPE data for 2001-2006 in April.
- DMIP 2 Special Issue of the Journal of Hydrology: submitted papers were pushed through the review process. OHD papers being refined. Murugesu Sivapalan will submit two papers.
- ABRFC gridded QPF data acquired for DMIP 2 forecast experiments.

Problems Encountered/Issues

1st Quarter FY08

- Two Hydro group members transferred to other OHD HSMB groups.

2nd Quarter FY08

- Gauge only gridded precipitation and temperature data found to have problems. Temperature problems were with time stamp and code for missing data in the underlying SNOTEL data. Temperature data fixed and posted to DMIP 2 web site. Precipitation data for 2003 to 2006 appear to be inconsistent with 1987 to 2002 data. Investigation underway as to cause. We would like to understand the inconsistency before using these data as a basic forcing into which we insert the HMT QPE data. One Hydro group member left to take over River Mechanics group; replacement won't start until Q3.
- Unsure whether to wait for HMT QPE data from winter 2006-2007 before using the data in DMIP 2: must analyze resources at ESRL, OHD, and NSSL.
- Third Hydr-ogroup member transferred to another HSMB group, leaving Mike to write both the DMIP 2 overview and results papers.

3rd Quarter FY08

- HMT radar QPE fields for 2005-2006 found to be deficient. The artifacts are visible at the 1 degree by 1km scale, but not really at the final 4km scale. The radar data needs to be reprocessed before it can be used for DMIP 2 or other HMT evaluations.
- Evaluation of OHD 'basic' gridded gauge-only QPE data being performed by CNRFC. These data were found to be deficient from 2003 onward but may be deficient from 1987 to 2002 as well.

4th Quarter FY08

- John Schaake worked at CNRFC to analyze the 1987-2006 gauge-only QPE grids: found the 2003-2006 period unusable. John developed a new strategy for estimating the obs times for daily stations and will regenerate the gridded time series data. His method was approved by Art Henkel and Rob Hartman.
- OHD Hydromet group found that reprocessed HMT radar QPE fields are still deficient. The OHD Hydromet group is working with ESRL and NSSL to solve the problems.

1st Quarter FY09

- Newly derived gauge-only precipitation grids for 1987-2006 should be finished by Jan. 31, 2009.
- Group discovered small problem with temperature data for a SNOTEL station outside of the North Fork basin boundary. Investigation revealed that the errors are only for a certain few years and that there are no impacts.

2nd Quarter FY09

- Another delay in deriving the QPE for the western basins. However, the work was started and put on a fast track. Another approach was planned as a back up. This second approach uses the Calibration MAP program and MPE.
- Hydro group found a small anomaly in the lumped, uncalibrated simulations for SLOA4; problem is the result of two slightly different parameter sets and is easily resolved.

OHD – NCEP Coordination

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Pedro Restrepo

Objective: Coordinate OHD and NCEP hydrologic modeling efforts

Milestones

Task	Due Date	Status
NCEP assign point of contact for coordination with OHD	Q2	Complete
Develop Detailed Work Plan	Q4	Complete

Accomplishments/Actions

1st Quarter FY08

- N/A

2nd Quarter FY08

- NCEP hired Jairui Dong to provide point of contact for coordination with OHD on NCEP hydrologic modeling activities

3rd Quarter FY08

- Work plan in progress

4th Quarter FY08

- Jiarui finished and presented the work plan. It was reviewed and accepted by OHD.

1st Quarter FY09

- Work in progress

2nd Quarter FY09

- Jiarui presented the progress report. Work is progressing according to schedule

Problems Encountered/Issues

1st Quarter FY08 - N/A

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09 - None

Support Distributed Model Implementation

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Provide training and support to RFCs as necessary to support implementation for river, flash flood, and new product forecasting.

Milestones

Task	Due Date	Status
1. Provide training and support to RFCs as necessary to support implementation for river, flash flood, and new product forecasting.	Ongoing	
2.		
3.		
4.		

Accomplishments/Actions

1st Quarter FY08

- OHD hosted NERFC personnel for 3 days of hands-on training.

2nd Quarter FY08

- MARFC requested hands-on training for early summer 2009
- At OHD's request, ABRFC modified the XDMS program to display gridded temperature
- OHD provided RFCs with guidance on how to derive channel routing parameters given that USGS event observations are no longer easily available.
- OHRFS spinning up use of HL-RDHM: OHD provided guidance on how to generate soil moisture simulations.
- Victor provided 'filled' Sac parameter grids to NERFC. Shane provided assistance to SERFC for Puerto Rico and the Tar basin. Shane helped John Halquist with Sac parameters for CONUS runs. Shane, Victor, and Naoki helped NERFC noted problems along the coastline with missing Snow-17 values.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY08

- Loss of contractor Shane Sheldon March 31.

Hydrologic Verification

Improve Ensemble Hindcaster

Core Goal: Verify our forecast and uncertainty information

Management Lead: Julie Demargne

Objective:

- 1) Use the NWSRFS Hydrologic Ensemble Hindcaster prototype to verify existing ensemble forecasts based on various ensemble preprocessing methodologies for XEFS test basins.
- 2) Integrate the NWSRFS Hydrologic Ensemble Hindcaster (including single-valued hindcasting) into the R&D XEFS prototype within the CHPS-FEWS environment. This is done via the configuration of customized FEWS workflows for specific forecasting scenarios. This activity depends on the progress made by the RFCs for the migration of their XEFS test basins into CHPS, in order to define the ensemble hindcasting workflows based on the operational deterministic forecasting process.
- 3) Develop additional capabilities for hindcasting with ensemble postprocessing (i.e., the EnsPost prototype)
- 4) Develop user's manual for installation and operation of the hindcasting workflows in the R&D XEFS prototype
- 5) Support the validation of the R&D XEFS components through hindcasting in CHPS and systematic verification with the Ensemble Verification System research prototype; this includes hindcasting scenarios with EPP3 ensemble preprocessor prototype, EnsPost ensemble postprocessor prototype, real-time bias-correction technique, and HMOS prototype and the analysis of the different sources of uncertainty. Publish the verification results for XEFS test basins in a scientific manuscript.

Milestones

Task	Due Date	Status
Use the NWSRFS Hydrologic Ensemble Hindcaster prototype to verify ensemble products from various ensemble preprocessing methodologies	FY09 – Q3	Ongoing
Integrate the NWSRFS Hydrologic Ensemble Hindcaster into R&D XEFS within CHPS-FEWS	FY09 - Q4	Ongoing
Develop hindcasting capabilities with ensemble postprocessing	FY09 - Q4	
Develop user's manual for installation and operation of hindcasting workflows in R&D XEFS	FY10 – Q1	
Support the validation of R&D XEFS components with systematic evaluation of existing ensemble products at RFC test basins	FY10 – Q3	

Accomplishments/Actions

1st Quarter FY09

- Participated in various meetings with Deltares and HSEB to discuss the hindcasting requirements and functionalities with FEWS for CHPS and XEFS. Single-valued and ensemble hindcasting capabilities were successfully tested using the current BOC CHPS prototype. The CHPS hindcasting capabilities are planned to be used for assessing the various sets of ensembles from the XEFS components once the test basins are migrated into the CHPS prototype (probably sometimes late spring or early summer).
- Discussed with Allen Bradley (University of Iowa) the current limitations of the ESP hindcasting capability with the reservoir operations; a temporary solution was developed by Allen B. to run the hindcaster prototype for the OHRFC test basins. This solution is not viable for CNRFC due to issues with other ESP operations.

2nd Quarter FY09

- Ran the NWSRFS Hydrologic Ensemble Hindcaster to generate flow ensemble forecasts for CNRFC test basin using the latest EPP3 precipitation ensembles based on QPF values. These ensemble hindcasts will be verified with EVS and presented for a poster on EVS verification for the HEPEX workshop to be held in Toulouse, France, on 15th-18th June, 2009.
- Discussed with HSEB and Deltares the BOC CHPS prototype and its hindcasting capabilities. The BOC CHPS prototype to be released in April 09 will be used to start the definition of hindcasting workflows for R&D XEFS.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

Develop Verification Strategies

Core Goal: Verify our forecast and uncertainty information

Management Lead: Julie Demargne

- Objective:**
- 1) Support the NWS Hydrologic Forecast Verification team and the WR Hydrology Verification team with the RFC verification case studies to develop standardized verification strategies for an effective communication of results to end users. This activity will include:
 - surveying all the RFCs on their current archiving practices and issues;
 - supporting the existing software and prototypes (IVP, EVS, and Ensemble Hindcaster) to run verification case studies;
 - gathering a list of enhancements for the existing software and prototypes to meet all user needs;
 - developing additional training material for the team members;
 - proposing standardized metrics and graphics to present verification results to identified users;
 - proposing performance tracking measures to show the level of success in river forecasting;
 - developing requirements for the NWS Performance Branch to disseminate RFC verification data and results;
 - working on verification case studies to evaluate the proposed verification standards (including baseline forecasts)
 - 2) Organize and conduct a second RFC verification workshop in Fall 08 with the NWS verification team to share verification experiences, present new science and software applications, and develop the final team report on verification strategies.
 - 3) Support the National Verification Focal Point to coordinate the verification activities within NWS, advocate for verification activities (AHPS, HOSIP/OSIP), represent hydrologic verification with respect to National Performance Management Committee (NPMC), contribute to verification policy decisions, coordinate hydrology verification journal articles and training development, and collaborate with academia, Deltares, NCEP, and the HEPEX project participants; this includes to define a HEPEX verification test bed in collaboration with Iowa State University, Environment Canada, Hydro-Québec, ECMWF, to evaluate existing and emerging verification methodologies and software for hydrological forecasting systems.

Milestones

Task	Due Date	Status
Support the WR Hydrology Verification Team	FY08 – Q3	Complete
Support the NWS Hydrologic Verification Team	As necessary	Ongoing
Organize and conduct 2 nd RFC verification workshop	FY09 – Q1	Complete
Support the National Verification Focal Point activities	As necessary	Ongoing
Propose standard verification strategies in the NWS Hydrologic Verification Team report	FY09 – Q3	Ongoing
Test the proposed verification standards with verification case studies	FY10 – Q3	

Accomplishments/Actions

1st Quarter FY08

- Worked on planning the verification activities for FY08 with the Verification Core Goal team, in coordination with the XEFS and RFC Archive Core Goal teams. The AHPS verification plan for

FY08 was sent to OHD management on 11/02/2007.

- Organized monthly meetings with the NWS verification team to review the team charter, deliverables and agenda, to determine the current archiving processes and issues at the 13 RFCs, and to select verification case studies for all RFCs. Participated in the meetings with the WR verification team to review CB- and CN-RFCs case studies.
- Participated in the NPMC monthly meetings, as well as the verification workshop in early November; OHD verification activities for both single-valued and ensemble forecast verification were presented.
- Discussed with Matt Kelsch the verification training modules that COMET is developing.

2nd Quarter FY08

- Finalized the AHPS verification plan for FY08 and gave a presentation to the HICs on 01/29/2008. All verification activities got funded at 100%.
- Continued to organize monthly meetings with the NWS verification team to determine the current archiving processes and requirements, to select verification case studies for all RFCs, and to gain expertise with IVP ob8.2 by working on an exercise. Started to organize the second RFC verification workshop for the week of November 18 or the week of December 09. Participated in the meetings with the WR verification team to review the NWRFC case study.
- Set up a new verification listserver called verify-hydro, to facilitate communication on verification with DOHs, OHD, verification teams, and Matt Kelsch at COMET.
- Worked on a BAMS paper entitled "Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service"; the proposal for this paper has been accepted as an In Box paper; sent the paper to the OHD management for review.
- Reviewed and updated a paper entitled "Completing the forecast: assessing and communicating forecast uncertainty" to be published in the ECMWF proceedings.
- Participated in the NPMC monthly meetings; discussed high impact event verification, GIS-based verification applications, and dissemination of verification information to the general public.
- Reviewed the verification training module developed by Matt Kelsch at COMET and discussed the training modifications with Kevin Werner and Holly Hartman.
- Sent training requirements to OCWWS for ensemble forecasting and verification.

3rd Quarter FY08

- Continued to meet with the NWS verification team to discuss the archiving requirements, review verification case studies for CB-, CN-, WG-RFCs, give a demo of EVS, and review exercises with IVP and EVS. Continued to organize the second RFC verification workshop for November 18-20. Participated in the meetings with the WR verification team to review the WFO case study and discuss the final team report.
- Support the verification listserver called verify-hydro, to facilitate communication on verification with DOHs, OHD, verification teams, and Matt Kelsch at COMET.
- Finalized the BAMS paper entitled "Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service", to be published as an In Box paper; the paper was submitted to AMS on 05/06/2008.
- Participated in the NPMC monthly meetings; continued to discuss GIS-based verification applications and best ways to disseminate verification information to the general public.
- Helped Matt Kelsch at COMET to finalize the verification training module with Kevin Werner and Holly Hartman; the module was made available on 06/01/2008 and was well received by members in the NWS verification team.
- Submitted a verification session proposal for the AGU Fall meeting; the session for which the co-conveners are Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne, was accepted.

4th Quarter FY08

- Continued to meet with the NWS verification team to review verification case studies for NE-, OH-, MB-RFCs, and review the EVS exercises. Continued to organize the second RFC verification workshop for November 18-20 in Salt Lake City. A draft agenda was sent to the team on 09/23/08.
- Continued to support the verify-hydro listserver.

- Started to revise the BAMS verification paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”; the revised paper will be submitted to AMS by the end of October 08.
- Continued to participate in the NPMC monthly meetings to discuss verification efforts at the regions, WFOs, NCEP and other agencies.
- Organized the verification session for the AGU Fall meeting with the co-conveners (Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne); 16 abstracts (including 2 abstracts from the HEP group) were submitted for this session, which will be scheduled as a poster session.
- Worked with Kristie Franz and Mike DeWeese on the verification of recent flood forecasts in NCRFC; an abstract has been submitted for the AGU Fall meeting.
- Started to prepare the AHPS FY09 verification plan with the Verification Planning Team on 09/23; reviewed the verification activities of the Hydrologic Ensemble Prediction (HEP) group on 09/29.

1st Quarter FY09

- Conducted the second RFC Verification Workshop in Salt Lake City on November 18-20. All the workshop material (presentations, exercise, recommendations) is available online on the verification team website (http://www.nws.noaa.gov/oh/rfcdev/projects/rfcHVT_workshop2.html). The evaluation survey showed that the workshop was very well received and should be conducted with this team every two years to discuss the progress on the various verification activities within the NWS and in academia.
- Continued to support the verify-hydro listserver.
- Finalized the BAMS verification paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”; the paper is scheduled to be published in the April issue.
- Led the verification poster session for the AGU Fall meeting with the co-conveners (Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne); 16 posters, including 2 from the OHD/HSMB/HEP group, were presented at this session.
- Finalized the AHPS FY09 verification draft plan with the Verification Planning Team and presented it to the OHD management in November 09.
- Developed the NWS Verification Team interim report to present the data archiving requirements, the 13 RFC verification case studies and the workshop recommendations. This interim report will be finalized by 01/16/09 and sent to the OHD management, the DOHs and the HICs to better coordinate the verification activities within the NWS and help develop the final team report.
- Started to develop standard verification strategies with the NWS verification team. These strategies will be described in the final team report and will need to be tested out with new RFC verification case studies.

2nd Quarter FY09

- Finalized the NWS Verification Team interim report on data archiving requirements, the 13 RFC verification case studies and the workshop recommendations; the report was sent on 01/22/09 to the OHD management, the DOHs and the HICs and is available on the team website at http://www.nws.noaa.gov/oh/rfcdev/docs/NWS-Verification-Team_interim_report_Jan09.pdf
- Met with the NWS Verification Team in February and March to discuss key verification metrics and plots, as well as standard verification strategies (including baseline forecast to evaluate the impact of run-time modifications on the forecast quality). The presentation of the proposed verification standards is available on the team website at http://www.nws.noaa.gov/oh/rfcdev/docs/Standard_verification_strategies_03202009.pdf
- Finished the first version of the NWS Verification Team final report to propose verification standards. On 04/01/09, the report was sent to the team members for a final review and to the OHD management; the report will be finalized by late April. The NWS Verification Team charter will have to be modified to continue the team work to evaluate the proposed verification standards with case studies and support the development of the verification services within CHPS.
- Finalized the FY09 verification project plan and presented it to the HICs and the ARC Committee. At the HIC/ARC meeting, presented a proposal for a standard baseline forecast to

evaluate the impact of run-time modifications on the forecast quality; the proposal will be revised to include the comments from the meeting.

- Continued to support the verify-hydro listserver to answer questions on verification software and case studies.
- Submitted one abstract for the Fourth International Verification Methods Workshop (Finland, June 2009) to present the progress made to communicate meaningful verification for real-time decision making.
- Submitted one abstract for the HEPEX workshop (France, June 2009) to present the HEPEX verification test bed.
- Described the HEPEX verification test bed for the NOAA-Environment Canada MOU agreement; signed the confidentiality agreement with Hydro-Quebec to get the test bed datasets.
- Participated in the NPMC meetings to discuss sky verification, consistency scores, and forcing input verification (NDFD verification and BOIVerify application).
- Discussed with COMET the 2 new verification training modules for FY09.
- Met with NCEP/EMC colleagues to discuss the verification products developed by NCEP and OHD; NCEP agreed to use RFC-defined spatial masks to provide the grid verification results for their forcing input ensembles on 3 different levels of spatial aggregation: by RFCs, by carryover groups, and by forecast groups.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 – None

3rd Quarter FY08

- For the NWS verification team, we had to postpone two meetings due to the recent flooding in the Mid-West and the overload of work at several RFCs. We plan to review all the RFC case studies before the 2nd RFC verification workshop on Nov. 18-20.

4th Quarter FY08

- For the NWS verification team, we had to postpone meetings to review RFC verification case studies. Four of the case studies for NW-, SE-, AP-, and NC-RFCs will be reviewed at the 2nd RFC verification workshop on Nov. 18.

1st Quarter FY09

- The charter of the NWS verification team will need to be modified to reflect the recommendations made during the workshop. The final team report with standard verification strategies is due by FY09 Q2. The team will need to continue to work on case studies to test these standards out and to assess the updated/new verification software applications and new science.

2nd Quarter FY09

- The final team report with standard verification strategies will be finalized by late April and the team charter will be updated to evaluate the proposed verification standards with case studies.

Improve Forecast Verification

Core Goal: Verify our forecast and uncertainty information

Management Lead: James Brown

- Objective:**
- 1) Improve ensemble verification capabilities by developing new verification techniques, and publishing the results in one or more scientific manuscripts. In particular:
 - ⇒ Develop simple diagnostic verification measures for key attributes of forecast quality, including discrimination.
 - ⇒ Evaluate methods for quantifying the sampling uncertainties of the deterministic and ensemble verification metrics, focusing on those in the EVS (e.g. through confidence intervals).
 - ⇒ Evaluate methods for diagnosing the phase (timing) and amplitude errors in flow forecasts, initially focusing on single-valued flow forecasts, then extending the technique to ensemble forecasts.
 - ⇒ Report on best strategy to combine information in several verification measures as an overall index of ensemble forecast quality.
 - 2) Extend the Ensemble Verification System (EVS) research prototype to include the new verification techniques, together with known feature requirements and ongoing feature requests from OHD scientists and the RFCs. The feature requirements will be listed and prioritized as they become known. Key goals include:
 - ⇒ Provide new verification measures, such as the ROC score and CRPS decomposition.
 - ⇒ Allow for skill calculations with the probabilistic scores relative to climatology (Brier Score and CRPS).
 - ⇒ Publish a manuscript documenting the capabilities of the EVS for an international scientific journal.
 - ⇒ Coordinate the development of the EVS with other stakeholders, including the WR water supply team, the RFCs and with the Thorpex-Hydro project.
 - 3) Support the development of a baseline verification tool for verification of single-valued and ensemble forecasts within the CHPS environment.
 - ⇒ Implement the necessary steps to allow the prototype EVS to run within the FEWS environment using a predefined EVS project file that references forecasts and observations in the PI-XML format and writes outputs to a predefined directory.
 - ⇒ Support HSEB in developing baseline code that is specific to the FEWS implementation of CHPS.
 - ⇒ Support the HSEB in implementing baseline code for a more general verification system (CHPS-VS) for single-valued and ensemble forecasts.
 - 4) Develop the scientific methods necessary to conduct Real-Time Verification (RTV) of ensemble forecasts and develop prototype software for the bias-correction of ensemble forecasts in real time.
 - ⇒ Identify and evaluate criteria for selecting historic analogs to real-time ensemble forecasts.
 - ⇒ Develop prototype displays of real-time verification information (which include historic analogs and summary verification maps) for discussion with the RFCs and others.
 - ⇒ Support HSEB in their development of baseline code for storing and selecting historic analogs to single-valued and real-time ensemble forecasts.
 - ⇒ Develop a prototype software tool for bias-correcting ensemble forecasts in real-time and implement and evaluate the technique experimentally at an RFC.

⇒ Write a manuscript on the bias-correction technique for publication in an international scientific journal.

- 5) Collaborate with COMET and other stakeholders to produce appropriate training material on verification science and software applications for both single-valued and ensemble forecasts.

Milestones

Task	Due Date	Status
Enhance the prototype Ensemble Verification System (EVS) and release the enhanced prototype together with documentation	FY09 Q4	Ongoing
Implement the steps necessary to run the EVS prototype within the FEWS environment and evaluate the implementation	FY09 Q4	Ongoing
Develop simple measures of ensemble forecast quality	FY09 Q4	Ongoing
Submit a scientific manuscript on the EVS prototype to an international journal, including a description of any new metrics proposed	FY09 Q4	Ongoing
Support the NWS verification team with their use of the EVS	As necessary	Ongoing
Evaluate methods for quantifying the sampling uncertainties of the verification metrics	FY09 Q4	Ongoing
Evaluate methods for diagnosing timing (phase) and amplitude errors, initially in single-valued forecasts	FY09 Q4	Ongoing
Report on best strategy to combine information from several verification metrics as an overall measure of ensemble forecast quality	FY09 Q4	Ongoing
Develop an experimental prototype for bias-correcting ensemble forecasts in real-time	FY09 Q2	Complete
Implement and evaluate the experimental prototype for bias correcting ensemble forecasts in real-time in collaboration with an RFC	FY09 Q4	Ongoing
Submit a scientific manuscript on the real-time bias correction prototype to an international journal	FY09 Q3	Ongoing
Develop prototype displays of real-time verification information for discussion with the RFCs and others	FY09 Q3	Ongoing
Develop scientific methods for real-time verification to select historic analogs and display summary verification maps	FY09 Q4	Ongoing

Accomplishments/Actions

1st Quarter FY09

- Supported the use of EVS by the RFCs and HEP. Provided an overview of EVS and various topics on ensemble verification at the 2nd RFC Verification Workshop at CBRFC in Salt Lake City, UT: 11/18/08-11/20/08. Support was also given to MARFC and ABRFC in conducting their case studies with EVS, which were presented to the Verification Team on 11/10/08.

2nd Quarter FY09

- Finished the first draft of a manuscript on the EVS for submission to the international journal: *Environmental Modelling and Software*. The manuscript provides an overview of the EVS software, the verification metrics available, how to add new metrics and presents several example applications (co-authors Brown, Seo).
- Finished the final draft of a manuscript on the real-time bias correction work, which uses indicator cokriging to estimate the unbiased (conditional) distribution of the forecast variable given the (possibly biased) real-time forecast. The manuscript will be submitted to the international journal: *Journal of Hydrometeorology* (co-authors Brown, Demargne, Liu, Seo).

- Started implementing the next major set of updates to the EVS software, which include:
 - The addition of skill calculations for the Brier Score and CRPS with the climatological probability forecast as the reference forecast;
 - The improvement of the aggregation procedure in the EVS for multiple forecast points;
 - The production of several R scripts for reading the numerical outputs from the EVS (in XML format) and writing high quality graphics in EPS format for journal publications;
 - The addition of several new metrics and improvements to existing metrics, including the CRPS decomposition and the ROC Score;
 - Improved documentation with examples.
- Defined the prototype displays of real-time verification information to be presented at the CAT workshop (scheduled for June 09); these prototype displays include verification summary maps for one metric (e.g., RMSE skill score) on various forecast points and analog displays using pre-defined historical events of interest. Started to discuss the data requirements with AB- and CN-RFCs.
- Developed one abstract for the Fourth International Verification Methods Workshop to be held in Helsinki, Finland, on 4th-10th June, 2009. The abstract presents the EVS verification prototype.
- Developed 2 abstracts for the HEPEX workshop to be held in Toulouse, France, on 15th-18th June, 2009. The abstracts present the non-parametric bias-correction method developed for real-time verification and the EVS results for EPP3 forcing input ensembles and corresponding flow.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

Logistical Verification

Core Goal: Verify our forecast and uncertainty information

Management Lead: Mary Mullusky

Objective: Compute, display, and disseminate forecast services logistical measures information.
Develop a plan to compute remaining logistical measures

Milestones

Task	Due Date	Status
1. Support of RFC verification focal points to populate the database	Q4	ongoing
2. Report of common forecast services metric queries	Q2	delayed
3. Display prototype maps of point forecast services	Q4	delayed
4. Experimental web pages of forecast services	Q4	delayed
5. Develop a plan to compute remaining logistical measures	Q4	delayed

Accomplishments/Actions

1st Quarter FY08

- Created a new policy, to require RFCs to populate and maintain the hydrologic forecast services tables in the IHFS database. The services information will be consolidated with the localized river location information required from the Weather Forecast Offices (see NWSI 10-924, Weather Forecast Office Hydrologic Reporting, <http://www.weather.gov/directives/sym/pd01009024curr.pdf>) in the National River Location Database. The new policy 10-914 *River Forecast Center Hydrologic Services Information*, was distributed to the regions in December with comments due Friday, January 11, 2008. Comments to be integrated in Q2.

2nd Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until April. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until August. This will impact our ability to require RFCs to populate the services database.

4th Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until December. This will impact our ability to require RFCs to populate the services database.

1st Quarter FY09

- No activity. Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

2nd Quarter FY09

- No activity. Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY08

- Regional comments integration into Policy 10-914 delayed until April. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY08

- Regional comments integration into Policy 10-914 delayed until August. This will impact our ability to require RFCs to populate the services database.

4th Quarter FY08

- Regional comments integration into Policy 10-914 delayed until December. This will impact our ability to require RFCs to populate the services database.

1st Quarter FY09

- Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

2nd Quarter FY09

- Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

Inundation Mapping

Static Flood Inundation Maps Web-Page Development and Deployment

Core Goal: Improve Flood forecast Inundation Maps – Static Maps

Management Lead: Victor Hom

Objectives:

- 1) Develop AHPS web page interface,
- 2) Deploy flood inundation maps in a national consistent, scientifically sound, and objective manner, and
- 3) Implement program elements to assure quality deliverables and maintenance of viability.

Team Members:

Brian Astifan – Eastern Region
Frank Bell – Southern Region
Brent Bower – Western Region
Laurie Hogan – Eastern Region
Victor Hom – Office of Climate Water and Weather Services / HSD
Kris Lander – Central Region
Doug Marcy – National Ocean Service / Coastal Services Center
Seann Reed – Office of Hydrologic Development / HSMB
Wendy Pearson – Central Region

I. Task Areas

Tasks	Responsible Organization
1. Regional Flood Mapping	NOAA NWS, NOAA NOS CSC, FEMA, USGS, USACE, and local Partners
2. Flood Mapping Training	NOAA NWS, NOAA NOS CSC
3. Program Policy and Strategic Planning	NOAA NWS, NOAA NOS CSC, Federal Partners
4. Web Evolution	NOAA NWS, NOAA NOS CSC
5. Maintenance/Service Maps	NOAA NWS, NOAA NOS CSC

NOTE: The task areas and milestones are now in groupings to better align with AHPS FY09 Annual Operating Plan and FY09 Program Funding Proposal. The AHPS Static Flood Mapping Program is becoming more mature and more able to branch from National to more regional initiatives. The reporting is to capture vertical and cross integration of the various program elements amongst NWSH, Regional/Local NWS Offices, and Federal/Local Partners.

II. Milestones

Task Area #1 - Regional Flood Mapping		
Subtask 1-1 Southern Region's Gulf Coast Libraries (FIM08-1P)	Due Date	Status
Implemented 4 map libraries for locations in Texas, 5 th library moved to 9/08	May 2008	Completed
Implemented total of 17 map libraries in FY08 for Southern region Gulf Coast Area courtesy of Hurricane Katrina Supplemental Funding.	Sep 2008	Completed
Implement up to 5 Flood Inundation Map Libraries	Jun 2009	In-progress Moved from Mar/2009
Implement up to 9 remaining libraries Flood Inundation Map Libraries	Sep 2009	In-progress
Subtask 1-2 Southern Region's Lower Colorado River Flood Libraries (FIM08-3P)	Due Date	Status
Implemented 3 libraries for Texas sites in the Lower Colorado Basin	Sep 2008	Completed
Implement up to 5 libraries in Texas (4 in the Lower Colorado and cross transfer WGRFC/LCRA technique to 1library for the San Antonio River)	Jun 2009	In-progress Moved from April 2009
Subtask 1-3 Eastern Region's Susquehanna River Flood Libraries (FIM08-4P)	Due Date	Status
Implement 3 libraries for Upper Susquehanna River Basin	Sep 2009	In-progress
Implement up to 6 libraries in the Upper, Mid, and Lower Susquehanna River Basin	Sep 2010	In-progress
Subtask 1-4 Eastern Region's Delaware River Flood Libraries (FIM09-1P)	Due Date	Status
Implement up to 7 libraries for Delaware River Basin	Sep 2009	In-progress
Subtask 1-5 Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P)	Due Date	Status
Implement up to 2 libraries	Sep 2009	In-progress Awaiting DHS funds
Implement up to 8 libraries	Mar 2010	In-progress Awaiting DHS funds
Implement up to 10 libraries	Sep 2010	In-progress Awaiting DHS funds
Subtask 1-6 Eastern Region's Ohio Flood Libraries (FIM09-3P)	Due Date	Status
Implement up to 2 libraries in WFO Cleveland HSA	Sep 2009	In-progress
Subtask 1-7 Eastern Region's North Carolina Libraries (FIM07-1P)	Due Date	Status
Implemented 16 map libraries for sites in North Carolina	Sep 2007	Completed
Implement map library for Tar River at Rocky Mount NC	Jun 2009	In-progress, Moved from 2/2008, Need to complete Map Review
Map Maintenance and improvements for Tar River Libraries	Jun 2009	In-progress, Moved from 2/2008, Need to complete Map Review

Task Area #2 - Flood Mapping Training		
Subtask 2-1 Develop and BetaTest Goto Training (FIM08-8P)	Due Date	Status
Overview of Flood Mapping Process	Mar 2009	Completed
CSC Contractor's Report on QC/QA (work was partially funded via FY08 subtask FIM08-6P)	Jun 2009	In-progress
AHPS Contractor's Report on Depth Grid processing (work was partially funded via FY08 subtask FIM08-8P)	Jun 2009	In-progress
Flood Mapping: Hydraulics and Hydrology	Jul 2009	In-progress
Flood Mapping: GIS Analyses	Aug 2009	In-progress
Quality Assurance and Checking: Stage 1	Oct 2009	In-progress
Quality Assurance and Checking: Stage 2	Nov 2009	In-progress
Training Module Development	Dec 2009	Awaiting Funds for CSC
Subtask 2-2 Develop Formal Residence Training and Hands-On Workshop (FIM09-4P)	Due Date	Status
NOAA NOS CSC/OCWWS HSD Perform Dry-Run of Residence Course at CSC Training Center	Nov 2009	In-progress
NOAA NOS CSC/OCWWS HSD Training Center Deliverable	Jan 2010	In-progress, Subject to FY10 funds for regional QAQC board and participants

NOTE: The task area #2 is an enhancement to FIM08-8P, previously titled "Develop Training". FY09 goals are to provide more detailed Training in different media formats, capture new QAQC goals in the AHPS Flood Mapping Process, and develop hands-on-workshop for the Regional Flood Mapping QC board.

Task Area #3 – Program Policy and Strategic Planning		
Subtask 3-1 Federal Guidelines and Statement of Work Templates (FIM08-2P)	Due Date	Status
Completed Guidelines Version 2.0	Jun 2008	Completed
Completed SOW Version 1.0 templates for H&H/GIS and AHPS Implementation (previous subtask FIM08-5P)	Jun 2008	Completed
Draft Guidelines Version 3.0	Jun 2009	In-progress
Draft SOW Version 2.0 templates for H&H/GIS and AHPS Implementation	Jun 2009	In-progress
Draft Guidelines Version 4.0 for ACWI Review	Jun 2010	On Hold
Draft SOW Version 3.0 templates for H&H/GIS and AHPS Implementation	Jun 2010	On Hold
Subtask 3-2 Evaluate the Need for Real-time vs. Static Inundation Mapping at NWS Forecast Points (FIM08-7P)	Due Date	Status
Preliminary Analysis, Development HOSIP SON, HOSIP Plan (work was partially funded via FY08 subtask FIM08-7P and HSMB Labor Funds).	Sep 2008	Completed
HOSIP Research and Analysis Phase 1 – Research and Collect Basic Data	Jun 2009	On Hold
HOSIP Research and Analysis Phase 1 - Validate hydraulic indices with detailed case studies	Dec 2009	On Hold
HOSIP Research and Analysis Phase 2 - Compute hydraulic indices and rate the need for real-time mapping at all NWS forecast points	Sep 2010	On Hold
Subtask 3-3 Western Region Flood Mapping Scoping and Planning for Partnered Candidates (FIM09-5P) (~FIM08-9P)	Due Date	Status
Present at NHWC about Flood Maps and Risk Mapping to Western partners, Meet with NHWC and Stakeholders.	May 2009	-
Scope and plan for FY10-FY11 AHPS Flood Inundation Map Libraries with Western Region.	Sep 2009	In-process
Subtask 3-4 Better Leverage with Risk Mapping Partnerships (FIM09-6P) (~FIM08-9P)	Due Date	Status
The objectives of this deliverable were to document Incentives (e.g. CRS Credits, StormReady, etc) and plan to develop Partnership Programs for Future AHPS Flood Mapping Sites.	June 2010	On-hold due to funding
Subtask 3-5 Program Management Support (FIM09-7P)	Due Date	Status
Develop conceptual linkage of Inundation Libraries to AHPS Probability Forecasts - (FIM08-10P)	Jul 2008	Completed -See Aptima Report
The objectives of this deliverable were (a) to develop a Long Term Plan based on Lessons Learned and Partnered Activities to ensure continuity and consistency in AHPS Flood Maps and (b) to provide governing principles to maintain the plan and assistance where necessary for OCWWS/OHD such as creation/maintenance of the AHPS Flood Mapping Toolkit, refreshing of OCWWS intranet Flood Mapping webpage, document management tracking of Federal Guidelines, and further enhancements/expansion of SOWs to meet the various partnership needs.	June 2010	On-hold due to funding

NOTE: Subtask 3-1 is dependent on in-kind support, therefore time delivery schedule is subjected to change. Subtasks 3-2, 3-4, and 3-5 are on-hold due to funding.

Task Area #4 – Web Evolution		
Subtask 4-1 AHPS Web Portal Updates (FIM09-8P)	Due Date	Status
Evaluate and Prioritize Changes to AHPS Portal for Flood Mapping.	Mar 2009	On Hold
Work with Contractor on Project Scope	Apr 2009	On Hold
Contractor Delivers FY09 AHPS Web Changes	Sep 2009	On Hold
Subtask 4-2 Google Map (FIM09-9P)	Due Date	Status
The objectives of this deliverable were to evaluate AHPS Flood Inundation Mapping and identify features that could be more effectively and efficiently implemented and rendered on Google.	June 2010	On-hold due to funding
Subtask 4-3 Prior Web Enhancements	Due Date	Status
Enhance AHPS Inundation Zoom Features (work was partially funded via FY08 subtask FIM08-5P)	Jun 2009	In-progress Moved from 12/08

NOTE: Subtasks 4-1 and 4-2 are on-hold due to funding.

Task Area #5 – Maintenance/Servicing Maps		
Subtask 5-1 Maintain AHPS Flood Maps (FIM09-10P)	Due Date	Status
The objectives of this deliverable were to evaluate, program, and fix Flood Maps for drastic changes to Flood Categories, land-use, infrastructure, and base maps which will render existing maps to be ineffective.	Sep 2010	On-hold due to funding

NOTE: Subtasks 5-1 is on-hold due to funding.

III. Accomplishments/Actions

FY2007

1st Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Completed initial look of web page interface and map capability
- Completed prototype, on CD, of initial flood inundation map location

2nd Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- With the departure of Tom Donaldson, Frank Richards will coordinate this task
- Orion developed a protocol to process information for the Web that will expedite production
- Watershed completed an inventory of 57 locations with available model and elevation information – 6 locations were selected for the first group of maps

3rd Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Goldsboro, NC, demonstration site is available on AHPS Web pages

4th Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Deployed 16 inundation map libraries on AHPS
- Improved web interface based on feedback from NWSH staff and field offices
- Orion produced DVD to describe AHPS flood inundation mapping interface
- Published article entitled "Genesis and Evolution of NOAA's Flood Inundation Mapping Service" for ASFPM Gilbert White Flood Forum

Develop Gulf Coast Libraries - (FIM08-1P)

- Watershed Concepts submitted 5 deliverables for NOAA to review

FY2008

1st Quarter FY08

Develop North Carolina Libraries - (FIM07-1P)

- NOAA has worked out some of the inefficiencies and deficiencies, which have led to past delays. New plans and insights were gained at NWS Flood Inundation Map Meeting entitled "Lessons Learned and Process Improvements" amongst members from NOAA, USGS, Watershed Concepts, Orion, Berry Williams and Associates, and NWS offices.

Develop Gulf Coast Libraries - (FIM08-1P)

- Watershed Concepts delivered ten (10) H&H map overlays for NOAA to review. NOAA now has total receipt of fifteen (15) deliverables and remains ahead of schedule to complete the year-end target goal of 20 inundation map libraries for FY08.

Develop Flood Libraries - (FIM08-3P), (FIM08-4P), (FIM08-9P)

- NOAA continues prospecting to build future inundation map libraries across USA for FY09 and FY10. Prospects included the Lower Colorado, Tennessee, Cumberland, Susquehanna, Delaware, and Blackstone Rivers.
- During this quarter, NOAA's out-reach activities and participation in ASFPM 2007 Flood Forum, FEMA 2007 Risk Analysis, and other inter-agency meetings, have led to stronger partnerships among FEMA, USACE, USGS, EPA, NRC, NAS, and FEMA CTPs. Partnerships will lead to better data sharing and collaborative efforts in building future map libraries.

2nd Quarter FY08

Develop Gulf Coast Libraries - (FIM08-1P)

- Orion delivers five (5) flood inundation map library for NOAA NWS review.
- NOAA CSC approves Watershed Concepts 2nd set of deliverables and furnishes them to Orion for development. NOAA now has total receipt of fifteen (15) approved deliverables and remains on schedule to field at least 20 inundation map libraries by end of FY08.
- Watershed Concepts delivered nine (9) additional H&H map overlays for NOAA CSC to review. CSC is working with Watershed Concepts to address QA/QC of these H&H map overlays.

Develop National Flood Inundation Library Guidelines - (FIM08-2P)

- Draft guidelines issued for NWS internal review.

Develop Lower Colorado River Flood Libraries - (FIM08-3P)

- WGRFC, LCRA, and Halff Associates produced a technique to incorporate results from HECRAS unsteady models to produce inundation maps at various incremental intervals interleaved between NOAA/NWS flood categories.

Develop Susquehanna River Flood Libraries - (FIM08-4P)

- Eastern Region (ER) met with cooperators concerning the development of flood inundation mapping libraries for locations within the Susquehanna River Basin. ER provided information on the process which NOAA NWS undertakes to produce these libraries. The Upper watershed was selected for evaluation.
- SRBC awarded study contract to conduct H&H/GIS for library development. Dewberry has completed the Chenago River study and working on getting local approval.

Enhance NOAA Procedures for Inundation Mapping - (FIM08-5P)

- Completed Draft SOW guidelines for H&H/GIS Work for internal review
- Completed Draft SOW guidelines for AHPS Web Implementation and Related Work for internal review.

Resource, Roadmap, and Recovery Plan (3 R's) - (FIM08-6P)

- Developed presentation conceptualizing the roadmap and process.
- Developed Intranet Website: <https://ocwws.weather.gov/intranet/floodmap/index.shtml> to house this conceptual reference and other resources.

Develop Training - (FIM08-8P)

- Issued FY09 Training Needs Statement.
- Course synopsis outline issued to AHPS IMTT for review.

Build Demonstration Inundation Libraries - (FIM08-9P)

- Review USGS proposal and techniques for Killbuck Creek in Ohio (KILO1).

3rd Quarter FY08**Develop Gulf Coast Libraries - (FIM08-1P)**

- NWS implemented four (4) flood inundation map library.
- NWS completed review of eight (8) more flood inundation map libraries, delivered in the 2nd set.
- CSC and OCWWS approved Watershed Concepts 3rd set of deliverables in July and have furnished them to Orion for development. NWS now has total receipt of sixteen (16) approved deliverables for AHPS implementation and remains on schedule to field at least 20 inundation map libraries by end of FY08.
- Watershed Concepts delivered three (3) new H&H map overlays (portion of the 4th deliverable) and updated the mapping for GBHT2 for CSC and OCWWS to review. CSC is working with Watershed Concepts and OCWWS to address QA/QC of these H&H map overlays.

Develop National Flood Inundation Library Guidelines - (FIM08-2P)

- Draft guidelines reviewed by participating NWS field offices.
- Draft guidelines reviewed by participating USGS field offices.
- OCWWS is in process of reviewing comments and ensuring guidelines addresses comments.

Develop Lower Colorado River Flood Libraries - (FIM08-3P)

- WGRFC worked with LCRA to conduct H&H/GIS work and produced the shapefiles needed for the development of AHPS inundation maps for seven sites.
- One of the sites, the Colorado River at Bastrop TX, will be available for NWS review on AHPS contractor's testbed in July 2008. Two other will be available before end of FY08.
- Establish contract through CSC to capture LCRA techniques used in unsteady modeling and evaluate the ability to transfer the technologic concept.

Develop Susquehanna River Flood Libraries - (FIM08-4P)

- SRBC, ER, BGM, and New York State are continuing to work with the contractor on the H&H/GIS.

Enhance NOAA Procedures for Inundation Mapping - (FIM08-5P)

- Completed Draft SOW guidelines for H&H/GIS Work for internal review
- Completed Draft SOW guidelines for AHPS Web Implementation and Related Work for internal review.
- Draft guidelines reviewed by participating NWS field offices.
- Draft guidelines reviewed by participating USGS field offices.
- OCWWS is in process of reviewing comments and ensuring guidelines addresses comments.
- AHPS Contractor has been tasked to provide enhancement of AHPS Procedures to build overlapping zoomable layers.

Resource, Roadmap, and Recovery Plan (3 R's) - (FIM08-6P)

- Provided training to SR via GotoMeeting on the roadmap and process.
- Added new documents and presentations about the process and implementation of AHPS Flood Mapping onto Intranet: < <https://ocwws.weather.gov/intranet/floodmap/index.shtml> >. See < <https://ocwws.weather.gov/intranet/floodmap/Outreach.shtml> > for more resources.

Partnering and Customer Requirements - (FIM08-7P)

- Responsibilities of this task were transferred back to the AHPS Static Inundation Mapping Core Goal team.
- The Core Goal team entrusted the Hydrology Lab to conduct an evaluation on suitable locations where NWS should develop AHPS static inundation mapping and on the proper approach/technique, which would lead to better understanding of the allocation of resources to prospect for partnering with customers.
- OCWWS and OHD met with the Hydrology Lab to discuss and review the draft proposal entitled "Analyze Site Characteristic at NWS River Forecast Points to Identify Steady State and Unsteady Modeling Requirements (with Implications for Inundation Mapping)".
- HSMB put together SON "Evaluate the Need for Real-time vs. Static Inundation Mapping at NWS Forecast Points" into HOSIP for Q4 FY10 completion.

Develop Training - (FIM08-8P)

- OCWWS provided GotoMeeting Training to SR on QA/QC of the Flood Mapping.

Build Demonstration Inundation Libraries - (FIM08-9P)

- USGS Indiana Science Center, Polis Center, and WFO Indianapolis demonstrated flood mapping capabilities on the White River at the ASFPM 2008 Annual Convention.
- Coordination amongst USGS Indiana Science Center, Polis Center Central Region, WFO Indianapolis, OHRFC, and OCWWS provided initial interest to pursue AHPS flood mapping services for Central Indiana for FY09.

4th Quarter FY08**Develop North Carolina Libraries - (FIM07-1P)**

- Tar River at Rocky Mountain, NC was delivered by Orion to NWS for review.
- At NWS request, Orion provided maintenance release of Tar River libraries to NWS for review. This maintenance release was to address mapping oversights.

- Orion also reprocessed other NC libraries to incorporate smoother transition and gradation of depth grids.

Develop Gulf Coast Libraries - (FIM08-1P)

- NWS implemented sixteen (16) flood inundation map library. Thirteen were provided through contract support services through NOAA CSC to Watershed Concepts and three were through partnered efforts amongst WGRFC and LCRA.
- NWS completed review twenty-one (21) flood inundation map libraries. Five of these libraries need further work before they can be implemented onto AHPS. This will be included in the Part I AHPS implementation for FY09.
- NOAA CSC, NWS, and Watershed Concepts are working to redefine and revise list of sites for AHPS flood mapping. This re-examination is required because the supporting data at prior selected sites were insufficient to carryout H&H analyses for quality flood maps. The final products will be included in Part II AHPS implementation.

Develop National Flood Inundation Library Guidelines - (FIM08-2P)

- USGS provided review comments on Version 2.0 Guidelines to OCWWS HSD.
- OCWWS is in process of reviewing comments and ensuring guidelines addresses comments.
- OCWWS has resumed dialogue with FEMA to better understand their organization and obtain FEMA support and guidance to flood mapping.

Develop Lower Colorado River Flood Libraries - (FIM08-3P)

- NWS implemented three (3) flood inundation map library through WGRFC/LCRA partnership.
- WGRFC is working with LCRA to conduct H&H/GIS work and produce the shapefiles needed for the development of AHPS inundation maps for four more sites.
- Watershed Concept through CSC contract will capture LCRA techniques for unsteady modeling and evaluate the ability to transfer the technologic concept to produce AHPS Flood Mapping in another watershed. The San Antonio River is being considered.

Develop Susquehanna and Delaware River Flood Libraries - (FIM08-4P)

- Category expanded to include DRBC (Delaware River Basin Commission) efforts to build AHPS Flood Inundation Map Libraries.
- DRBC, ER, BGM, PHI, and USACE Philadelphia District are working to develop seven flood inundation map libraries on the Delaware River. Model evaluations have been conducted and the H&H analyses are being reviewed.
- SRBC, ER, BGM, and New York State are continuing to work with the contractor on the H&H/GIS.
- Contractor has submitted SRBC studies for FEMA to approve.

Enhance NOAA Procedures for Inundation Mapping - (FIM08-5P)

- Completed SOW Version 1.0 Templates and Appendix to Guidelines posted to OCWWS Intranet.
- AHPS Contractor has been tasked to provide enhancement of AHPS Procedures to build overlapping zoomable layers.

Resource, Roadmap, and Recovery Plan (3 R's) - (FIM08-6P)

- The Gulf Coast project has provided substantial case studies and examples of QC/QA and lessons learned during this period.

Partnering and Customer Requirements - (FIM08-7P)

- OH's Hydrologic Science and Modeling Branch (HSMB) is conducting an evaluation on suitable locations where NWS should develop AHPS static inundation mapping and on the proper approach/technique. This would lead to better understanding of the allocation of resources to prospect for partnering with customers.
- HSMB has submitted SON and is working on HOSIP.

Build Demonstration Inundation Libraries - (FIM08-9P)

- USGS Indiana Science Center, Polis Center, and NWS wrote a proposal to Indiana for funding

Upper Midwest Flood Mapping Project, which would result up to 20 AHPS Flood Inundation Map Libraries by end of FY10.

- USGS will be awarded the work upon Indiana's acceptance of the proposal.

FY2009

1st Quarter FY09

Develop North Carolina Libraries - (FIM07-1P)

- OCWWS provided QAQC training to Eastern Region and SERFC and communicated expectations on the review of the new Tar River at Rocky Mount NC map and four other revised maps for the Tar Basin.

Develop Training - (FIM08-8P)

- Eastern Region helped identified the need for Training in Stage 1 QAQC. As a result, NOAA/NOS/CSC provided a goto meeting to demonstrate some expected outcomes from Stage I QAQC. NOAA/NWS/OCWWS provided GoTo training on Stage II.
- OCWWS HSD provided two teletrainings one for CR and another for WR staff on 1) Overview of the technical aspects of the map development process; 2) Overview of the NWS inundation mapping program/goals; and 3) Advice on outreach and development of inundation mapping partnerships.

Develop linkage of Inundation Libraries to AHPS Probability Forecasts - (FIM08-10P)

- OCWWS provided FEMA officials an overview of the Aptima Report which provided a conceptual web interface showing inundation maps and risk/loss estimation tools in association with AHPS Probability Forecasts and hydrographs at FEMA stakeholder's meeting.
- OCWWS provided USGS officials an overview of the Aptima Report which provided a conceptual web interface showing inundation maps and risk/loss estimation tools in association with AHPS Probability Forecasts and hydrographs at NOAA-USGS quarterly meeting.

2nd Quarter FY09

Develop North Carolina Libraries - (FIM07-1P)

- NWS field offices reviewed the revised Tar River flood maps. HSD is coordinating the review and working to collectively address comments.

Southern Region's – Gulf Coast Flood Libraries (FIM08-3P)

- AHPS H&H/Geospatial Contractor is completing resubmission of 5 Flood Map Libraries: White Oak Bayou - Houston, TX (HGTT2), Black Warrior River - Tuscaloosa, A (TODA1), Vermillion River - Lafayette, LA (VLS1), Clear Fork Trinity River - Weatherford, TX (WEAT2), Tickfaw River- Holden, LA (HOLL1). There are a total of nine libraries under Phase II, where hydrologic, hydraulic, and geospatial analyses are being performed.

Southern Region's – Lower Colorado River Flood Libraries (FIM08-3P)

- WGRFC provided additional flood inundation maps to be implemented onto AHPS. The deliverables were to Orion for flooding beyond the 1% Annual Chance Flood and supplements the other inundation polygon shapefiles for Colorado at Bay City Texas (BACT2). NOAA coordinated with Watershed Concepts on the H&H/Geospatial Analyses for San Antonio River at Goliad TX (GLIT2), approved the Stage 1 QC, and forwarded deliverables to Phase III AHPS Implementation.

Eastern Region's Delaware River Flood Libraries - (FIM09-1P)

- ER HSD is working with ER WFOs on Quality Assurance of Delaware River Basin Commission flood map deliverables. The project is in phase 2 of the Flood Mapping Process and the field offices are poised to work on several flood map libraries and perform stage 2 QC of phase 3 of the Flood Mapping Process in FY09Q3

Eastern Region's Susquehanna River Flood Libraries (FIM08-4P)

- NOAA CSC and OCWWS HSD reviewed SRBC contractor's methodology to develop flood depth rasters. This new deliverable was suggested because of the systematic approach and precision in the creation of flood depth values. The net result should be improved deliverables and better assurance of quality. OCWWS HSD and ER are working on getting funds to use this new delivery method and process them into AHPS.

Eastern Region's - Ohio Flood Libraries (FIM09-3P)

- WFO CLE is working on delivering AHPS Flood Maps for the Blanchard River at Findlay Ohio (FDYO1) and Killbuck Creek in Killbuck OH (KILO1). OCWWS HSD provided comments about the Findlay project, which is in Phase 3 and likely deployed in early part of Q3 to AHPS.

Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P))

- OCWWS HSD presented at USGS Midwest Area Leadership Training and provide USGS Midwest and Eastern Water Science Centers a perspective of NWS AHPS Flood Inundation Mapping efforts. Specifics were discussed about the Indiana partnership. In addition, NWS, USGS, and the Polis Center will be working to tie the mapping information to FEMA's HAZUS tool and Google Earth. USGS will also be evaluating the potentials for extending 2D models to build dynamic maps. FEMA region V was also represented.

Develop and BetaTest Goto Training - (FIM08-8P)

- CSC and OCWWS provided 1.5 day training specific to QC Stage I checking of the shapefile product deliverables from Hydrologic, Hydraulic, and Geospatial Analyses at NOAA CSC Training facilities in Charleston, SC. This was in response to ER needs, as identified in their work with the DRBC, and the need to stand-up regional boards to assist in Stage I QC. ER and CR staff provided valuable comments in the formulation of the course. .

Develop Formal Residence Training and Hands-On Workshop (FIM09-4P)

- CSC and OCWWS met and drafted a course outline, course schedule, and course development/milestone plans for the hands-on-work shop to be fielded by the regional QC flood mapping board.

IV. Problems Encountered/Issues

FY2007

1st Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Schedule for North Carolina locations impacted by web farm consolidation process.

2nd Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Delays in identifying locations resulted in later completion of the first group of locations, but final completion of the project may not be delayed

3rd Quarter FY07

Develop Gulf Coast Libraries - (FIM08-1P)

- Delays in prioritizing sites as well as slow response by FEMA to request for engineering study information caused project to slip by ~ 90 days
- Since Engineering data were only available for 28 of the 55 candidate sites, alternative sites had to be identified.

4th Quarter FY07

Develop North Carolina Libraries - (FIM07-1P)

- Original H&H (Hydraulics and Hydrology) studies in the Lumberton NC area was for the river reaches in the vicinity of USGS gage. To create the proper inundation map library for NWS forecast point on the Lumber River at Lumberton NC, a re-study may be required to cover the desired spatial extent. OCWWS has removed Lumberton from inundation library development.

FY2008

1st Quarter FY08

Develop Gulf Coast Libraries - (FIM08-1P)

- NOAA and Watershed Concepts worked on several iterations of the five deliverables which was first furnished to NOAA at the end of FY07. The deliverables included assumptions concerning ponds and ineffective areas, which manifest in dangled polygons that are unconnected to the main channel. Watershed Concepts will implement tighter controls and re-allocate resources to ensure better QC/QA. Tighter controls will also be enforced to reduce oversights on the depth grids as a result of the conversion process from TIN to raster. Consequently, map inundation libraries for the initial five Texas sites will not be available until February 2008.

Develop North Carolina Libraries - (FIM07-1P)

- NOAA re-evaluation of the map library for Lumber River in Lumberton NC indicated a re-study would be required. To ensure forward momentum and progress toward FY08 goals, NOAA has discontinued the map library for the Lumber River in Lumberton NC but will add a map library for the Tar River in Rocky Mount, NC by April 2008.

2nd Quarter FY08

Develop Gulf Coast Libraries - (FIM08-1P)

- The USGS has converted the reporting procedures for several gages to elevation NAVD88, which required local WFO to establish new flood categories.
- The schedule for the first five deliverables were affected by the methods used to produce Depth grids. The lowest inundated shapefile did not necessary produce the base layer needed for computation. Lack of DEM resolution could pose problems. H&H/GIS contractor will need to provide ASCII depth grids. Consequently, this required more hands-on QA/QC, thus, the 1st deliverables will likely be available on AHPS at end of May 2008.

Enhance NOAA Procedures for Inundation Mapping - (FIM08-5P)

- NOAA/NWS discussed the goal of Flood Inundation Mapping and the document with Hugh Schratwieser, NOAA Office of General Counsel. NWS is awaiting OGC advice and suggestions. OGC verbally did not see any major issues with concept and indicated their willingness to assist in our cause.

3rd Quarter FY08**Develop North Carolina Libraries - (FIM07-1P)**

- Flood Maps for the Tar River at Rocky Mount NC requires additional evaluation and QA/QC on the AHPS testbed prior to deployment.

Develop Gulf Coast Libraries - (FIM08-1P)

- Mapping was not performed for enough flood inundation levels due to flood category changes for two mapping sites in Southeast Texas.
- During this quarter, NWS held one (1) flood inundation map library from AHPS deployment. Additional flood mapping is required for GBHT2 (Greens Bayou near Houston TX) because the flood stage was lowered by 6.0 feet. This library will be re-scheduled for deployment before end of FY08-Q4.
- Delays in the approval of the third deliverable due to H&H/GIS mapping deficiencies have resulted in a tighter available time-window to implement mapping for FY08. OCWWS, CSC, and OHD are working on additional techniques to ensure QA/QC is sufficiently conducted in the allotted time window.

Resource, Roadmap, and Recovery Plan (3 R's) - (FIM08-6P)

- The "Lessons Learned" and QA/QC report will include evaluation of flood mapping performed in the 4th deliverable which is slated for implementation at the end of CY08. To ensure a better report, since the 4th deliverable included more difficult analyses, the combined report will be moved to Apr 09.

Partnering and Customer Requirements - (FIM08-7P)

- The Hydrology Lab indicated that there were inadequate funding to complete an identified task requirement but was interested in partnering with OCWWS to carry-out the task. With pooled resources, contract labor, and in-kind efforts, the report to satisfy an evaluation on suitable locations for flood mapping is now projected for completion between FY09 Q2 and Q3.

4th Quarter FY08**Develop North Carolina Libraries - (FIM07-1P)**

- NWS needs to provide QA/QC Training to ER, RAH, and SERFC to approve maps. QC/QA Training will occur in Q1 FY09.

Develop Gulf Coast Libraries - (FIM08-1P)

- Watershed Concepts need to remodel (a) CART2 (Elm Fork on Trinity River in Carrollton TX) because of new highway interchanged and (b) GBHT2 (Greens Bayou) and HGTT2 (White Oak Bayou) because of substantial flood category changes.
- Insufficient data to carryout H&H analyses for quality flood maps have resulted in delays. NWS have decided to pursue AHPS implementation into two parts for FY09. The selected sites will be Part II implementation by end of FY09.

Develop National Flood Inundation Library Guidelines - (FIM08-2P)

- OCWWS has re-engaged FEMA and better understands FEMA's reorganization, such that NWS will proceed with vetting Version 3.0 of the Guidelines through FEMA prior to submission to ACWI. OCWWS HSD will modify due dates after a commitment with FEMA has been established.

Develop Susquehanna and Delaware River Flood Libraries - (FIM08-4P)

- Both projects are subjected to Partners' priorities and funding.
- NWS has adjusted the schedule to align with AHPS contractor's delivery of other AHPS Flood Map Libraries.

Partnering and Customer Requirements - (FIM08-7P)

- OCWWS aligned the schedule with anticipated HOSIP completion.

Enhance NOAA Procedures for Inundation Mapping - (FIM08-5P)

- New Hydrology Program priorities and deadlines were given to AHPS Contractor, therefore the work to "*Enhance AHPS Inundation Zoom Features*" will be delayed by one quarter.

FY2009

1st Quarter FY09

Develop Training - (FIM08-8P)

- AHPS Core Goals team has identified that detailed training is needed to ensure a consistent National program across the regions and assure success with regional partners. The training should describe in detail the procedures from Phase I to Phase IV of the Flood Mapping Process in an integrated coherent fashion. Although the adhoc goto sessions have been helpful, they do not provide hands-on experience for the partnership to conduct various project tasks with tools normally available for this type of effort. Additional training for the following is subject to FY09/FY10 funding: Flood Mapping: Hydraulics and Hydrology, GIS Analysis, Stage 1 & Stage 2 Quality Assurance and Checking, and Maintenance.

2nd Quarter FY09

Develop Gulf Coast Libraries - (FIM08-1P)

- Due to insufficient mapping and modeling resources, NWS and CSC are working with Watershed Concepts to seek alternative sites in the Gulf Coast region. Since there is limited new detailed Flood Insurance Studies with sufficient topographic data at NWS AHPS forecast points in Alabama, Mississippi, and Louisiana, mapping efforts will need to focus more in Texas. As a compromised, NOAA CSC will secure H&H Models and Shapefile outputs for Western North Carolina sites in the French Broad Watershed (BLTN7, BIRN7, TKS7, CTPN7) are being considered for future map developments.
- The five proposed libraries: Guadalupe River near Bloomington, TX (DUPT2), Guadalupe River at Victoria TX (VICT2), Brazos River near Rosharon TX (ROST2), Pine Island Bayou near Sour Lake, TX (SOLT2), Aldridge Creek at Sherwood Dr Huntsville, AL(SHEA1) are awaiting detail mapping and data for H&H modeling.

Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P)

- NWS/USGS/Polis Center cannot start work until State of Indiana receives funding from FEMA.

Inputs and Forcings

Prototyping NMQ for FFMP

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: Ken Howard and Jian Zhang, NSSL; Mary Mullusky and David Kitzmiller, NWS

Objective: To test a high resolution Cartesian based regional multisensor QPE and QPF as input into FFMP and to facilitate a NCEP implementation of NMQ system for the national creation of QPI products and prototype dissemination to individual RFCs and weather forecast offices. The following project builds upon the FY05 NMQ to FFMP demonstration project and a FAA sponsored project for the implementation of the NMQ 3-D reflectivity mosaic code set within NCEP operational environment. Through an NCEP implementation, the full NMQ product suite can be prototyped and enhanced for potential utilization within RFC operations as well as within WFOs in FFMP.

Milestones FY06

Task FY06	Due Date	Status
Creation of initial 'radar only' Q2 products on a Cartesian grid of 1-kilometer resolution with refreshing rate of five minutes CONUS.	March 15, 2006	Completed
Implementation of Q2 gage correction scheme using NCEP gage data feed.	May 15, 2006	Completed
Creation of and delayed preliminary real time multisensor Q2 products on a Cartesian grid of 1-kilometer resolution with refreshing rate of five minutes CONUS.	June 15, 2006	Completed
Dissemination of Q2 products on a Cartesian grid of 1-kilometer resolution updated every five minutes for CWA (Phoenix) regions for ingest into FFMP.	July 1, 2006	Q2 product creation Completed – Ingest into FFMP set for Q1 Fy07
Development and access to a web based interface for the real time verification of QPE estimates and associated uncertainties CONUS.	July 1, 2006	Completed
Performance evaluation of Q2 products in FFMP	December 1, 2007	Planned

Milestones FY07

Task	Due Date	Status
Data exploration and coordination for the performance evaluation of NMQ/Q2 radar only products in FFMP	December 1, 2007	Q2 product creation completed in fy06 – Ingest into FFMP moved to Q2 FY08
Initial NMQ Code transfer and implementation for the creation of 3-D reflectivity mosaic products and 2-D severe weather products (HAD, VIL, etc.).	May 1, 2007	Completed
Creation of seamless 'radar only' QPE products on a Cartesian grid of 1-kilometer resolution refresh rate of five minutes CONUS at NCEP.	June 1, 2007	Pending Computing resources and requirements
Develop operational strategies for inclusion and dissemination of NMQ QPE products to WFO's and RFC's	August 1, 2007	Pending Computing resources and requirements
Configure NMQ QPE as a prototype external data source for RFC and WFOs	September 30, 2007	Completed

Milestones FY08

Task	Due Date	Status
Customization of NMQ Q2 product real time dissemination per RFC domain	December 1, 2008	Completed
Infusion of Canadian and TDWR radar data as available into NMQ NCEP QPI grids	April 1, 2008	Completed for NMQ system
National prototype 2.5 minute update cycle for NMQ and QPE products	July 1, 2008	Beginning in Q3 FY09
Initial development and testing of a multi sensor 'best of the science' QPE product	August 30, 2008	Planned
Development strategies and testing protocols for Dual polarization data in Q2	September 20, 2008	Planned

Milestones FY09

Task	Due Date	Status
Customization of NMQ Q2 product real time dissemination per RFC domain	Continuous	Completed
Evaluation and testing of VPR corrected QPE using case studies	May 1, 2009	Planned
Complete hardware and software design/configuration for national NMQ implementation	July 1, 2009	Planned
Assessment of Q2 performance in collaboration with RFC	August 30, 2009	Planned
Implementation of new PERSIANN satellite rainfall estimation algorithm in NMQ/Q2	September 20, 2009	Planned

Accomplishments/Actions

1st Quarter FY06

- Completed assessment and comparison of WDSS-II ingest, QC (NN) and 3D mosaic (merger) with NMQ application.
- Initial coding and testing of 'radar only' Q2 has been completed. CPU load tests for running initial CONUS Q2 product suite have been completed. Hardware configuration and system updates for running initial Q2 products CONUS to be complete by 2/28/06.
- Several case studies have been completed regarding the generation of VPR s and possible 'gap' corrections on 3D mosaic fields. Real time CONUS VPR correction coding is in progress.

2nd Quarter FY06

- The initial suite of NMQ Q2 QPE products is being generated in real time, nationally, with a five-minute update cycle at 1x1 km resolution. The initial Q2 products and national mosaic products are being disseminated using ftp and Idm protocols to collaborators and researchers at NCEP, NESDIS, RFCs, OHD, UCAR, ESL, GLERL, NCAR, Unidata and the FAA.
- A website has been established to provide 'quick looks' at the NMQ and Q2 product suites. The NMQ website forms the basis of NSSLS QPE Verification System (QVS) currently under development. The initial QVS webpage is located at nmq.ou.edu/~qpeverif/Experimental/. The QVS page is experimental and will continue to evolve as products and verifications tools are added.
- Hardware and software is currently being configured for the Arizona Q2 prototype system The Southwest Q2 system will be delivered to the Salt River Project/NWS facility in early June 2006. The system will serve as the basis for generating and testing high resolution Q2 QPEs into FFMP in the southwest encompassing several CWAs. Testing is anticipated to begin 1st QR 07. However, Q2 QPEs in the southwest will be generated beginning July 1 and will be made available for use in the Arizona Flood Warning System for evaluation and verification.

- The North American Scale Remote Sensor Precipitation Estimation OSIP SON was officially posted on 3/29/06.

3rd Quarter FY06

- The Southwest Q2 system has successfully been deployed at the joint SRP/PHX NWS facility. The system integrates Phoenix TDWR data along with 6 WSR-88Ds in the region. High resolution Q2 products are being generated for the state of Arizona. The Southwest Q2 data is ready for inclusion in the FFMP demonstration project, which is set to begin in FY07 Q1. Currently Q2 products for Arizona are being archived and analyzed for several significant precipitation events that occurred during July 2006.
- The NMQ Q2 products continue to be generated in real time nationally with an average latency of less than 110 second from product valid time. The initial Q2 products are continually under refinement and assessment through the NMQ QPE verification system (QVS). Additional QPE products have been add to the QVS such as the NEDSIS hydro-estimator.
- Vertical Profiles of Reflectivity (VPRs) are currently being generated for each WSR-88D with real time VPR plots on the NMQ QVS system. A gap filling technique utilizing the VPRs is currently being evaluated over the eastern 1/3 of the CONUS. Once a gap filling assessment is completed, a VPR correction will be deployed CONUS within the NMQ. Additionally, several QPE related algorithms are being developed utilizing VPRs in determining bright band height and the presence of warm rain microphysics for dynamically adjusting the Z-R relationships.
- 31 radars from Canada are being received and ingested within the NMQ system. The individual Canadian radars are being compared with adjacent WSR-88Ds using the Radar Reflectivity Calibration Tool (RRCT) to determine offsets leading to techniques for correctly combining Canadian radar with the WSR-88Ds in the NMQ 3-D Radar Mosaics and Q2 products.
- A new gauge-biasing scheme has been deployed within NMQ Q2 product suite and has been under real time performance assessment via QVS.
- A NMQ blog has been implemented for notification of NMQ and Q2 updates and system status. The NMQ Blog is viewable at nmq.ou.edu/~qpeverif/blog/

4th Quarter FY06

- The NMQ Q2 system CPU cluster and communications servers were moved to a new National Weather Center computer room.
- The new URL for the NMQ system webpage is www.nmq.nssl.noaa.gov.
- The Stage 4 product suite has been added to the NMQ system QVS verification system. The Stage 4 products can be directly compared with Q2 products as well as HE products as well as with gauge observations.
- The NMQ Blog contains changes and enhancements to the NMQ system including documentation.
- The 31 Canadian radars have been added to the NMQ RRCT tool for evaluation leading to incorporation into the 3D mosaic snag d Q2 products during Fy07.

1st Quarter FY07

- Completed Fortran coding of new radar reflectivity quality control for single radar reflectivity field. The new radar QC was specifically developed for the NCEP implementation for computational efficiency and is based upon a linear heuristic rule set.
- Completed Fortran code set for NMQ radar ingest and polar to Cartesian transformation.
- Completed code set port for 3D single radar Cartesian reflectivity (SRC) product.
- Completed initial port and CPU resource testing of NMQ single radar Cartesian ingest and QC applications on NCEP mainframe.
- Completed Fortran/C++ coding of Q2 radar only QPI applications with ongoing testing currently.
- Completed and implemented additional statistical analysis tools on QPI verification system.
- Several logic changes were implemented in the polar processing SRC components towards improving the accuracy of QPI products currently being generated on the NMQ system. These

changes are focused on mitigating the impacts of radar calibration offsets. For detailed info on the changes see the NMQ blog located on the NMQ homepage (www.nmq.nssl.noaa.gov).

2nd Quarter FY07

- Initial code port to NCEP of radar quality control, single radar Cartesian transformation and 3D mosaic has been completed.
- The Q2 BAMS manuscript has undergone final review and submission.
- Scripts for the required formatting and clipping of Q2 QPI fields as input to FFMP have been completed and tested.

3rd Quarter FY07

- Completed coding and testing of automated technique for the identification of warm rain microphysics (tropical precipitation rates). The technique will augment the current Q2 pixel by pixel segregation of precipitation regimes and differential z/r assignments to include a 'tropical' classification. The technique builds upon our VPR based applications currently running and displayable within NMQ.
- A description of the warm rain identification technique along with case studies have been completed with a formal paper on the technique submitted to the Journal of Hydrology.
- The warm rain technique is currently being implemented on NMQ for real time CONUS evaluation.
- Q2 'radar only' and 'local gauge bias' products are being formatted in XMRG and are being made available to the Arkansas-Red Basin River Forecast Center for evaluation.
- A bright band top and bottom identification (BBID) technique along with freezing level height products have been full implemented on NMQ and are currently being utilized in Q2 products. The technique is based upon VPRs in combination with RUC model analysis. A formal paper describing the VPR based BBID has been submitted to the Journal of Hydrology.

4th Quarter FY07

- The automated technique for the identification of warm rain microphysics (tropical precipitation rates) was implemented on August 12, 2007 and is currently running in real time within the NMQ/Q2 system. Evaluations are on going as to the national performance of this component. The warm rain addition completes the warm season Q2 QPI application and a paper describing the Q2 warm season technique(s) is in preparation for submission to Journal of Hydrology.
- Twenty-two (22) new dual CPU servers were added to NMQ hardware configuration. The new servers were configured for radar data ingest, QC and SRC creation with the tested capacity to process HiRes level 2 data WSR-88D in addition to 31 Canadian radars and TDWR data streams.
- The Canadian radars are being compared with the WSR-88D network and assessed for calibration and attenuation limitations. A preliminary report has been prepared and submitted to the FAA (copied provided to OHD) on quality control deficiencies associated with the Canadian radar network. Testing of new Canadian radar specific QC techniques is currently underway. The real time Q2 QPE product generation using the Canadian radar blended with the WSR-88D is planned for completion by 2nd Q FY08.
- The real time Canadian radar data stream has been added to the Radar Reflectivity Comparison Tool.
- Q2 'radar only' and 'local gauge bias' products are being formatted in XMRG HRAP and are being made available to the West Gulf River Forecast Center for evaluation in real time. Preliminary feedback is favorable towards improvements in coverage and quality of Q2 QPE products.

1st Quarter FY08

- Completed scripts and communication protocol for providing River Forecast Centers with real time Q2 products.
- Completed code and configuration changes to ingest real time high resolution 88D L2 for NMQ and Q2 products.

2nd Quarter FY08

- Providing, in real time, Q2 product suite to the following RFCs - ARBRFC, WGRFC, CBRFC, and ORFC.
- Continued interactions with RFC staff on Q2 product strengths and weakness. Feedback from RFCs continues to be favorable towards improved coverage, continuity, and quality of Q2 QPE products for potential use in operations.
- Revised several thresholds and system parameters for the tropical precipitation identification. System updates can viewed at http://docs.google.com/View?docid=dcf7xh8d_31gkwgqj54

3rd Quarter FY08

- Established new NMQ/Q2 server and website – nmq.ou.edu
- Documentation for establishing the NMQ systems as a stand-alone operational system has been provide to NCEP and OHD. The documentation included hardware specifications, software and system configuration.
- With the assistance of the Salt River Project and the PHX FO, Q2 products are being made available to 4 forecast offices for use in FFMPA. An evaluation protocol will be established to receive feedback from individual offices in Q4.
- Canadian radar 3D mosaics are being generated in real –time every 5-munites at 1x1km resolution within the NMQ system. Product grids containing the Canadian radar data will be made available in Q4.

4th Quarter FY08

- Updated NMQ and Q2 QPE products grids to encompass 33 Canadian radars. The products are available in digital form and viewable on the NMQ website – nmq.ou.edu.
- Testing is currently underway for hardware and software configurations required for 2.5-minute update cycle for the NMQ products.
- A detailed assessment of Q2 performance during calendar year 2008 has been completed and made available to OHD in PowerPoint form.
- Q2 products were made available in real time to the Phoenix forecast office as an input into FFMPA beginning July 15 to current. Evaluation is ongoing.

1st Quarter FY09

- N/A

2nd Quarter FY09

- Q2 QPE products produced during the 2008 PUFFS project are being validated as input for FFMPA. 8 FF events are being analyzed and compared to Stage 2 MS in collaboration with the Phoenix forecast office.
- Testing and evaluation of a VPR corrected QPE algorithm has been completed on 14 cases. A VPR corrected Q2 QPE product will be implemented in real time CONUS in FY09 Q3.
- Q2 QPE products are currently being disseminated in real-time to 7 RFCs in addition to NOHRSC in FY09 Q2.
- Activities and discussions continue with OHD and NCEP regarding documentation of NMQ/Q2 hardware and software specs, configuration, and costs for a NCEP implementation

Problems Encountered/Issues

1st Quarter FY06

- All previous NMQ hardware and facility issues have been corrected and/or resolved.
- During the process of standardizing code sets utilizing WDSS-II, it was determine that the creation of a single radar high-resolution 3-D reflectivity Cartesian grid (SRC) would improve the overall efficiency, timing and accuracy of Q2 products for infusion into FFMP. A high resolution 3-D SRC will be created in real time for each WSR-88Ds and then mosaic with subsequent product generation. The refresh rate for the SRC grids will initially be 5 minutes with a horizontal resolution of 1x1 km and 31 vertical levels.
- Transition to WDSS-II coding and operating environment for CONUS NMQ radar ingest, and radar quality control on NMQ system is on going and will be completed by March 1, 2006.

2nd Quarter FY06

- The WDSS-II Neural Net radar Quality Control (NNQC) application was found to be deficient in addressing radar QC issues associated with night 'blooms' and other artifacts. Additional cases are being assembled to facilitate further training of the NNQC application. Previously tested NMQ QC logic is being reimplementation on the NMQ system to augment the NNQC towards improving radar quality specially to address bloom occurrences.

3rd Quarter FY06 - None**4th Quarter FY06 - None****1st Quarter FY07**

- Initial bench tests of radar ingest and SRC creation on the NCEP system identified potential CPU and memory allocation shortfalls. Additional testing will be conducted to ascertain memory and CPU requirements.

2nd Quarter FY07

- Testing of Q2 QPI fields into FFMP postponed until 3rd quarter due to a delay in the new FFMP.

3rd Quarter FY07

- Testing of Q2 QPI fields into FFMP postponed until 1st FY08 quarter due to a delay in the new FFMP.

4th Quarter FY07

- Offsets in Q2 HRAP grids for WGRFC have been resolved.
- Testing of Q2 QPI fields into FFMP postponed until possibly 2ndQ FY08 to allow time to resolve communication and ingest issues associated with FFMP advanced.
- CPU resource limitations and programmatic priorities have delayed implementation of Q2_CST modules at NCEP. The NMQ/Q2 system at NSSL continues to provide QPI fields to RFCs and GSD until such time resources are made available. PPBS for FY10-14 include Q2 transition to NCEP.

1st Quarter FY08 - None**2nd Quarter FY08**

- The NMQ verification system moved to University of Oklahoma computing infrastructure.

3rd Quarter FY08

- A major effort was expended during this period to address issues related to ingest and qc of super_res base level data. New QC applications for super_res are currently being evaluated.
- 14 -dual processors HP servers were procured and will be added to the NMQ level 2 processing server farm. The additional servers will facilitate an increased in temporal and spatial resolution of NMQ products starting in Q4.

4th Quarter FY08

- The super_res base level data was found to be extremely noise and required significant investigation in to mitigating the noise in base QC as well as impacts on VPRs. Initial changes were made in the QC code, which were not effective and introduced a low bias in Q2 QPEs with tropical events in June, July and August. Techniques are being reassessed, modified and tested to mitigate the impacts of super_res on QPE products.

1st Quarter FY09 - N/A**2nd Quarter FY09 - N/A**

Quantitative Precipitation Estimate Evaluation for CI-FLOW

Core Goal: Improve the quality of physical inputs and forcings

Management Leads: David Kitzmiller, OHD and Suzanne VanCooten, NSSL/OAR

Objective: Evaluate significant precipitation event(s) over the Tar River basin (North Carolina) to identify an optimum set of techniques as an initial step towards a state-of-the-science NOAA multi-sensor *quantitative precipitation information* (QPI) for NWS operations. The evaluation will include an assessment of OHD, NSSL and NEDSIS QPI algorithm components towards determining strengths as well as areas requiring collaborative research and development. Evaluations will include comparisons with independent rain gauge data, operational stage 4 products, *and impact tests on hydrologic simulations*.

Milestones

Task	Due Date	Status
Create multisensor gridded precipitation analyses for the cool-season event 10 December 2004 – 15 January 2005	May 4, 2007	Complete
Assess the performance of various QPI components towards the overall performance of gridded precipitation estimates	June 30, 2007	Complete
Complete radar-gauge multisensor analyses for Dec 2004-Jan 2005 cool season case, run RDHM hydrologic simulations, report on results	June 30, 2008	Complete
Collect and quality control all necessary rain gauge data for Sep 2003 and Jun 2006 warm season cases	June 30, 2008	Complete
Create radar-gauge multisensor analyses for Sep 2003 and Jun 2006 warm season cases, run RDHM hydrologic simulations	Aug 31, 2008	Complete
Compile and document components from each QPI algorithm that, based on the assessment, would contribute towards an optimum MSQPE solution for NWS operations	Sep 30, 2008	Slip to FY09 Q3
Report on the evaluation and develop collaborative research strategy (draft preprint for AMS Hydrology Conference; draft journal article)	Dec 31, 2008	Completed Conference Presentation; Journal Article Draft- FY09 Q4

Accomplishments/Actions

1st Quarter FY07

- OHD – created basic radar input to MPE and High-Resolution Precipitation (HPE, formerly EMPE) for remaining test events
- NSSL – prepared reference data sets for computing various QPI grid fields
- Limited activity due to lack of funding.

2nd Quarter FY07

- NSSL- Assembled data sets of rain gauge observations collected under the radar umbrellas of KAKQ, KRDY, and KMHX for a period encompassing November 1, 2004 to February 28, 2005. NWS HADS provides the rain gauge data within the radar umbrellas but outside the Tar Basin itself.
15 minute precipitation data from 38 USGS precipitation sites, AWOS locations
1 Hour precipitation data from USGS, RAWS sites, North Carolina Econet, ASOS and AWOS
24 Hour reports from NWS COOP observers
- NSSL, OHD, NCDC – Performed QA/QC on data set to document erroneous reports and questionable values
- NSSL - Coordinating FTP site and access criteria for all research partners to access one common rain gauge data set with accompanying documentation on possible erroneous values

discovered from QA/QC procedures

- OHD – established necessary raingauge and radar databases for running MPE and HPE, began test runs with cool season case

3rd Quarter FY07

- OHD – Created one set of MPE (4-km) and HPE (1-km) hourly gridded analyses for periods with precipitation during the December-January 2004-05 period. Carried out initial evaluation, indicating a few suspect hourly gauge values were still in the dataset; then reran the analyses. Overall performance of the precipitation algorithms is as expected for a winter situation – most information in the precipitation grids appears to come from gauge input.
- OHD – made arrangements for running hydrologic model HL-RDHM with precipitation input
- NSSL, NCDC, OHD – agreed to rerun the MPE/HPE, and run Q2 algorithms, using ASOS gauge reports not included in the original analysis.

4th Quarter FY07

- NSSL – completed a set of radar-only and multisensor precipitation grids for the cool season case and forwarded them to other participants. Rainrate grids forwarded to NESDIS for input to ScAMPR satellite/radar algorithm
- OHD – completed a set of MPE/HPE radar-only, gauge-only, and multisensor precipitation grids, and carried out an initial analysis of their quality with respect to the reference rain gauges. It appears that the radar information in the multisensor grids adds slightly to the quality of the gauge-only analyses, possibly because the study period was dominated by stratiform rainfall with only one convective event
- Some further analysis of the OXFO rain gauge site record was carried out by OHD and NCDC – it now appears there were problems with freezing precipitation and/or gauge mechanics during part of the period, which will be dropped from the reference dataset
- Examination of the meteorological record indicated frozen precipitation over the basin during one of the storm events. Therefore the hydrologic model simulations must be run with hourly surface temperature input – a dataset from RUC and Eta model analyses and forecasts was gridded for this purpose
- AMS Hydrology Committee accepted an abstract for a paper to be presented at the upcoming Hydrology Conference (January 2008)

1st Quarter FY08

- Compared and analyzed the NMQ and HPE radar-only QPE analyses for the Dec 2004 – Jan 2005 period. It appears the NMQ handled challenging situations with unusual Z-R relationships better than did the NEXRAD PPS-based HPE. This resulted in the NMQ estimates having the smaller bias and smaller random error components. Results for both rain gauge and RDHM hydrologic model intercomparisons were consistent.
- Compiled results into a preprint for the AMS 22nd Hydrology Conference in January
- Funding to complete the analysis of warm season cases was applied for through AHPS process

2nd Quarter FY08

- Results of cool-season study were presented in a poster session at AMS Hydrology Conference
- After re-examination of rain gauge reports, reran MPE/HPE for the cool-season period, and obtained multisensor (gauge-radar) as well as radar-only fields
- Reran RDHM hydrologic simulations with MPE and HPE input fields – results will be analyzed next quarter
- Carried out manual inspection and QC of HADS hourly gauge reports for September 2003 and June 2006 study periods

3rd Quarter FY08

- NSSL submitted Q2 gauge-radar precipitation analyses for cool season case; OHD converted them to xmrq format
- Researchers collaborated on collection and quality control of gauge data for the two warm season cases
- OHD completed generation of input radar products for warm season cases

4th Quarter FY08

- Completed rain gauge QC and selection of reference gauges for two warm-season events. OHD created radar-gauge MPE products for Sep 2003 Isabel case.
- An abstract on the project results was accepted for presentation at upcoming AMS hydrology conference
- NSSL completed generation of input radar products and created radar-gauge Q2 products for Sep 2003 Isabel case and June 2006 Alberto case

1st Quarter FY09

- Completed generation of MPE/HPE datasets for June 2006 case
- For the June 2006 (TS Alberto) case: completed analysis of HPE and NMQ radar-only and gauge-radar accuracy, in terms of rain gauge-reference verification scores and RDHM simulations of discharge at 7 gauging points.
- For Sep 2003 Hurricane Isabel case, discovered a problem with NMQ radar analysis, and prepared for case reruns.
- Based on issues with changes in code versions and algorithm improvements since the start of the experiment, decided to rerun NMQ analyses for all cases prior to making a final analysis.
- NSSL verification system and case study library updated and configured to include HPE results to use common verification system and calculations

2nd Quarter FY09

- Completed radar-only QPE analyses for NMQ and MPE/HPE for all three storm periods
- Obtained stream discharge measurements for all study basins, January 2003 through June 2006
- Ran RDHM with SERFC operational precipitation estimates for the period January 2003 through June 2006 and obtained some verification statistics on its performance
- Began re-checking rain gauge data after closer examination revealed some problems with time shifts in reconstructing hourly rainfall totals from 15-minute totals

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07 – None

3rd Quarter FY07 - None

4th Quarter FY07

- Some delays required to track down potential problems with reports from one reference gauge, and to collect/prepare temperature input to RDHM.

1st Quarter FY08

- Some delays required to track down potential problems with reports from several rain gauge sites; must rerun multisensory analyses for the cool-season case Jan-Dec 2004-2005. Results to date are sound, however.

2nd Quarter FY08 - None

3rd Quarter FY08

- Some delays to perform thorough QC on warm-season rain gauge data, and to track down rain gauge reports from different sources that appeared or vanished between 2003 (the Isabel case) and June 2006

4th Quarter FY08

- Had to recreate Q2 radar-gauge multisensor analyses for Dec-Jan 2004-05 events, due to metadata error.

1st Quarter FY09

- Discovered problems with NMQ radar analyses for Sep 2003 event – will reanalyze

2nd Quarter FY09

- Need to re-check and recreate some rain gauge information; still anticipate completion by Q4 of FY09

Gauge-Radar Analyses in High-Resolution Precipitation Estimator (HPE)

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: David Kitzmiller

Objective: Include a capability for rapid-update gauge-only or gauge-radar gridded precipitation analyses in HPE

Milestones

Task	Due Date	Status
Demonstrate features of 15-minute gauge-radar analyses based on continuous-reporting rain gauges and HPE 15-minute radar estimates	FY08 Q3	Complete
Advise on appropriate radius of influence for individual gauge reports	FY08 Q3	Complete
Develop software for inserting rain gauge information from Point Data Control application in radar-based rain estimate grids from HPE; <i>anticipate initial field trials through AWIPS Test and Notification (ATAN) procedure</i>	FY08 Q4	To be extended

Accomplishments/Actions

2nd Quarter FY08

- Collected requirements for the application from staff at WFO Monterey and Sacramento and Western Region headquarters
- Derived basic gauge-radar merging algorithm, which preserves gauge-based values in the grid

3rd Quarter FY08

- Using the gauge-radar merging algorithm, applied to 15-minute rain accumulations from radar and dense rain gauge networks over Florida, a set of graphics were developed and sent to field sites and HSEB for comment

4th Quarter FY08

- After examining experimental objective analyses using different interpolation methods, will advise use of a 10-km radius of influence for the gauge data. It can be blended with radar data in a range annulus of 5-10 km relative to the nearest gauge.
- Algorithm description document drafted – for nearest neighbor and inverse distance weighting approaches to grid interpolation

1st Quarter FY09

- Worked on modifying existing Point Data Control codes to estimate 15-minute rain gauge totals from randomly-timed subhourly accumulation reports
- Ran performance tests of nearest-neighbor and inverse-distance weighting analysis algorithms

2nd Quarter FY09

- Visited WFO PSR (Phoenix) and learned about their use of reports from a dense rain gauge network covering the Phoenix metropolitan area.

Problems Encountered/Issues

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 – N/A

2nd Quarter FY09 – Work is on hiatus, with personnel concentrating on CHPS forcings code needed in FY09

Assessment of QPF Produced By 2-4 km WRF-based Storm Scale Ensemble for NOAA's Hazardous Weather Test bed Spring Experiment

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: Suzanne Van Cooten, NSSL

Objective: Evaluate QPF output produced by a high resolution, convection allowing 10 member WRF-based Storm Scale Ensemble Forecast (SSEF) run at 4 km grid spacing and other deterministic convection allowing WRF models run at 2-4 km grid spacing by the University of Oklahoma Center for the Analysis and Prediction of Storms (CAPS), NCAR, EMC, and NSSL for NOAA's Hazardous Weather Testbed (HWT) 2007 Spring Experiment. QPF output from the NSSL and EMC deterministic WRF models are also available throughout the year.

An assessment will be completed to determine the accuracy and usefulness of high resolution WRF model QPF output, including probabilistic information from the SSEF, to NOAA hydrologic services. This assessment will ascertain if the SSEF and other WRF models produced for the 2007 Spring Experiment created QPF fields which add value for both the very near term, in a WFO Flash Flood Monitoring and Prediction (FFMP) application, and a somewhat longer term of up to 12 hours for RFC usage in forecasting mainstem river stages

Milestones

Task	Due Date	Status
1. Selection of student for QPF ensemble assessment	Apr 2008	Complete
2. Create gridded fields of QPF produced by each member of the WRF-based ensemble	June 2008	Complete
3. Development assessment methods and criteria to determine accuracy and usefulness of WRF QPF output	July 2008	Complete
4. Report on QPF evaluation and develop implementation strategies to evaluate QPF value in FFMP applications	Oct/Nov 2008	Complete

Accomplishments/Actions

2nd Quarter FY08

- University of Oklahoma School of Meteorology Graduate Student selected for research assignment (Craig Schwartz to be supervised by Jack Kain (NSSL))
- Initiate creation of gridded fields of QPF produced by each member of the WRF-based ensemble for the Spring 2007 HWT experiment

3rd Quarter FY08

- Developed data manipulation and statistical analysis tools and began preliminary analysis of convection-allowing datasets, including benchmark measures of forecast skill and sensitivities to model physical parameterizations and horizontal resolution.
- Worked with NCEP/EMC scientists to import hourly precipitation forecasts from the operational NAM for detailed comparison with output from convection-allowing models.

4th Quarter FY08

- N/A

1st Quarter FY09

- Analyzed hourly precipitation fields from convection-allowing ensemble forecasts and selected

deterministic members of the ensemble.

- Produced a preliminary summary of results and prepared two separate presentations and extended abstracts for AMS Conference on Severe Local Storms (SLS), focusing on 1) sensitivity of QPF to horizontal resolution and comparison with current NCEP operational models, and 2) new methods to produce improved probabilistic QPFs from convection-allowing ensembles.

2nd Quarter FY09

- Project has been completed

Problems Encountered/Issues

2nd Quarter FY08

- AHPS Funding not released

3rd Quarter FY08

- None

4th Quarter FY08

- N/A

1st Quarter FY09

- None

2nd Quarter FY09

- None

Satellite Based Analysis for Potential Evaporation

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: David Kitzmiller; project lead Yu Zhang

Objective: To provide satellite-based, real-time PET estimates and nowcasts as input forcing for the Community Hydrologic Prediction system (CHPS)

Milestones

Task	Due Date	Status
1. Research results and recommendations of PET estimation and forecast frameworks*	FY10/Q1	On track
2. System for infusing temperature, humidity, wind data	FY10/Q1	
3. Preprocessors of GOES-based solar radiation	FY10/Q1	
4. PET computation and corroboration	FY10/Q2	
5. Research paper on evaluating estimated PET*	FY10/Q4	
6. Preprocessor for NDFD gridded forecasts	FY11/Q1	
7. PET forecast framework	FY11/Q1	
8. Research paper on evaluating PET and soil moisture forecast*	FY11/Q2	

Accomplishments/Actions

2nd Quarter FY09

- Initial research underway – literature review and review of OHD's previously supported research by U. New Hampshire
- Collected some RTMA GOES-based cloud cover grids for the CONUS, for potential use as a proxy for manual sky cover

Problems Encountered/Issues

2nd Quarter FY09

- Funding not committed until FY09 Q3

Flash Flood Services

Distributed Hydrologic Model with Threshold Frequencies (DHM-TF)

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Michael Smith

Objective: Understand the nature of the model errors when running a distributed hydrologic model forced by WFO type data streams (e.g. 15 minute resolution observations and nowcasts). Do additional historical precipitation analysis to support the threshold frequency approach. Collaborate with the Sterling WFO to evaluate the model applied to two domains in MD.

Milestones

Task	Due Date	Status
1. 2007 Task: First cut Poor Person's reanalysis for MARFC	Q2	Complete
2. Finalize parameterizations for two model domains (2 km – Baltimore; 4-km – MD).	Q3	Complete
3. Prepare GIS scripts to aid Sterling in viewing outputs	Q3	Complete
4. Help Sterling and Pittsburgh set up prototype model	Q3 FY09 Q4	Ongoing
5. Run historical hydrologic simulations to generate gridded statistics.	Q3	Complete
6. Complete historical analysis begun in 2007 (events and overall statistics for selected basins)	Q4	Complete
7. Monitor real-time HL-RDHM runs; archive and analyze case studies	FY09 Q1	Complete
8. Maintain and monitor MPN runs within OHD	FY09 Q1	Complete
9. Additional work to improve and understand the limitations of the Poor Person's re-analysis; develop data set for a second RFC	FY09 Q2	Complete
10. Recommend high level requirements for operational development	FY09 Q2 FY09 Q4	Ongoing
11. Publish results	FY09 Q2 FY09 Q4	Ongoing

Accomplishments/Actions

1st Quarter FY08

- Completed 2007 task: corrected statistical algorithms to properly account for zero flows in dry areas

2nd Quarter FY08

- Completed 2007 task: completing first cut Poor Person's re-analysis for MARFC

3rd Quarter FY08

- Began initial 4km simulations and analysis of Maryland case study.
- Constructed basic set of GRASS GIS visualization scripts needed by OHD and MARFC.
- Communicated with Joe Ostrowski of MARFC to ensure close collaboration on DHM-TF project.

4th Quarter FY08

- Finalized parameterizations for 4km and 2km implementations
- Completed historical simulations needed to compute gridded statistics

- Conducted initial set of historical analyses to further study behavior of DHM-TF system
- Monitored real-time HL-RDHM simulations and MPN runs within OHD

1st Quarter FY09

- Completed Grass GIS and Google Earth scripts needed to visualize DHM-TF output
- Modified code to deal with low and high flow cases with return periods not solvable by traditional technique
- Began coordination work with Sterling WFO necessary to implement DHM-TF on Sterling computer system.
- Presented DHM-TF at MARFC WFO and secured agreement to implement DHM-TF at MARFC after the system has been implemented at the Sterling WFO.

2nd Quarter FY09

- Enhanced Google Earth scripts needed to visualize DHM-TF output
- Contacted Pittsburgh WFO and obtained their support and necessary WFO computer account access for efforts to implement DHM-TF prototype at WFO
- Began derivation of routing parameters over Pittsburgh domain
- Redeveloped HOSIP project plan for DHM-TF, also, work will be continued under new AHPS project
- Investigated potential collaborative opportunities with ABRFC, in particular with respect to their low water crossing survey effort
- Developed new DHM-TF case study over Maryland and published in EWRI Water Congress 2009 paper

Problems Encountered/Issues

1st Quarter FY08

- We got a basic real-time run setup for the 4-km MD domain in the fall of 2007, but we did not have time to monitor, archive, and analyze case studies due to Seann's move to the Hydraulics Group and Ziya's extended leave in the fall.

2nd Quarter FY08

- Seann Reed, DHM-TF developer and leader, has been reassigned to the River Mechanics group. Replacement is planned to start work in Q3 FY08.

3rd Quarter FY08

- Overall progress was greatly slowed by staff changes. Replacement for Seann Reed was hired and began work on DHM-TF project in June.

4th Quarter FY08

- Investigation is currently underway to determine the length of flow history needed for accurate computation of return periods. Computation may not be robust under certain situations if only 10 years of data is used.

1st Quarter FY09

- Certain low and high flow cases lead to return periods that are not solvable by traditional approach. A temporary solution has been put in place, but a more robust (higher precision) solver needs to be implemented.

2nd Quarter FY09

- Due to personnel resource issues at the Sterling WFO, work with them was put on hold. Pending resource availability, work will resume with Sterling over the next quarter.
- Routing parameters are proving to be challenging to derive due to the size of the mainstem rivers in the Pittsburgh domain

Flash Flood Potential Index

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Greg Smith (Colorado Basin RFC)

Objectives: FY06 – 4th qtr FY08:

- Deliver FFPI output to several NWS offices for evaluation / feedback
- Incorporate a dynamic soil moisture component into FFPI
- Evaluate best platform for FFPI should utilize (based on feedback)

FY07 – FY08 - Explore / Expand FFPI use in the generation of FFG.

FY08 - Potential for future expansion / improvements for FFPI beyond FY08.

FY09 – Complete recommendations to FF Services for CONOPS.

Milestones:

Task	Due Date	Status
Acquire & Prepare finer resolution GIS datasets	4th qtr FY06	Completed
Update and incorporate methodology and application process	4th qtr FY06-FY07	Completed
Ability to create FFPI on a national scale and document process	4th qtr FY06-FY07	Completed (CONOPS decision)
Identify offices willing to evaluate product	3 rd qtr FY06	Completed
Deliver-Test static product – obtain / incorporate feedback	4 th FY06-1 st qtr FY08	Completed
Incorporate a dynamic soil moisture component (ext to FY08)	4 th qtr FY06-FY07	Extended (feedback dependent)
Acquire FF Event Data / Verify FFPI Output (ongoing – ext to FY08)	4 th qtr FY06-FY08	Completed CBRFC (& ongoing)
Define a method to incorporate FFPI in FFG generation (ext to FY07)	4th qtr FY06-FY07	Completed
Peer Review of FFPI Methodology / Application	FY06-FY08	Completed (& Ongoing)
Re-define future CONOPS based on testing / evaluation	FY09	On Schedule
Recommendations for CONOPS & Improvements/Updates	FY09	On Schedule

Accomplishments/Actions

1st Quarter FY06

- Obtained MRLC 30 meter resolution land-use dataset for conterminous U.S.
- Obtained national forest density dataset.
- Converted and merged approximately 25-30% of MRLC data required for application
- Visited PHX WFO (CBRFC funded) to implement initial FFPI for testing/feedback.

2nd Quarter FY06

- Continued to merge MRLC datasets required for application
- Acquired national DEM dataset required for application
- Identified several offices willing to test/evaluate product

3rd Quarter FY06

- Identified scale & methodology issues and addressing these.
- Completed FFPI for LAX office (western region test office)
- Set list of alpha test stations for initial FFPI testing
- Continued to manipulate national datasets for use in FFPI procedure

4th Quarter FY06

- Converted all available MRLC datasets for use in FFPI procedure.

- Developed initial implementation plan for Alpha test sites.
- Continue to manipulate remaining datasets for utilization in FFPI process.
- Continued to manipulate national datasets for use in FFPI procedure.

1st Quarter FY07

- Re-sampled datasets to FFPI grid-cell resolution for alpha test site regions.
- Loaded alpha test site geographic boundaries and clipped datasets to match.
- Met with USFS remote sensing center to verify proper application of wildfire burn data.
- Developing a process with USFS for obtaining wildfire burn data for FFPI application.
- Obtained numerous wildfire burn area datasets for FFPI application.
- Continued to manipulate national datasets for use in FFPI procedure.

2nd Quarter FY07

- Completed creating FFPI for RNK test sites (working on delivery methods).
- All Data acquired for conterminous test sites, ABQ/SGF near completion
- Started review of GRASS GIS and GFS as working environments for FFPI
- Developed FFPI-FFG methods for the CNRFC

3rd Quarter FY07

- Completed FFPI for ABQ (have not yet delivered)
- Developed a checklist for evaluation FFPI performance at test sites
- Identified possible soil moisture components for application to FFPI
- Incorporated FFPI into FFG development at CNRFC
- Visited Las Vegas office and delivered FFPI

4th Quarter FY07

- Modified methodology for incorporating slope data layer into FFPI
- Tested Arc-IMS as an option for delivery of product to FFPI
- Continued to develop final FFPI for CONUS and SJU sites. These are nearly complete.

1st Quarter FY08

- Completed FFPI for SGF.
- Incorporated finer resolution DEM data for SGF, ABQ, and RNK sites.

2nd Quarter FY08

- Successfully moved FFPI to the GFE (Graphical Forecast Editor) platform
- Continued analysis and development focused on incorporating finer resolution DEM

3rd Quarter FY08

- FFPI completed for all sites except HFO, work is ongoing for that site (4th qtr completion)
- Scheduled visits to beta test sites to be completed in the 4th quarter.
- Significant progress was accomplished toward final delivery of FFPI to beta test sites.

4th Quarter FY08

- Traveled to AGF, installed FFPI files for review and gave presentation to staff.
- Traveled to ABQ, installed FFPI files for review and gave presentation to staff.
- Traveled to SJU, Installed FFPI files for review and gave presentation to staff.
- Installed RNK FFPI remotely and gave a presentation to RNK Staff.
- Installed SGF FFPI remotely and gave a presentation to SGF Staff.
- Update GJT FFPI files remotely
- Completed FFPI for HFO
- Obtained initial feedback in order to prepare recommendations to FF Services.
- Reviewed FFPI role in gridded FFG - Determined CBRFC course of action.

1st Quarter FY09

- Beta test sites requested more time to evaluate. Some initial feedback has been obtained.

2nd Quarter FY09

- Continued to evaluate feedback from FFPI beta sites.
- Discussed strategic options with OCWS HSD toward making FFPI available to NWS offices.

Problems Encountered/Issues

1st Quarter FY06

- Some slowdown encountered do to lack of available software licenses
- Some slowdowns do to processing power required, storage requirements for finer resolution data sets.
- Timetable subject to RFC operational responsibilities (minimal impact to date)
- Acquiring timely wildfire burn severity data from the forest service is still challenging. WRH has conducted meetings aimed at accelerating this process and I've been involved in those. Unfortunately this process isn't under NOAA's control.

2nd Quarter FY06

- RFC workload / operational responsibilities have had a significant impact on 2nd (and 3rd) quarter development. Most of these tasks will slip at least 1 qtr. Still hopeful to accomplish many 4th qtr tasks on time.

3rd Quarter FY06

- RFC workload / operational responsibilities continued to impact development. Less impact is anticipated during the 4th qtr and early FY07. Some tasks and product delivery will slip into the first half of FY07.

4th Quarter FY06

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

1st Quarter FY07

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

2nd Quarter FY07

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

3rd Quarter FY07

- No real problems but RFC responsibilities occasionally impact development and delivery schedule.

4th Quarter FY07

- No real issues, RFC operational responsibilities and associated travel for training have pushed delivery into early FY08.

1st Quarter FY08

- Minor problems encountered with some FFMP Basin Files. Currently trying to re-acquire some FFMP basins.
- No other real issues, RFC operational and basin focal point responsibilities occasionally impact development activities.

2nd Quarter FY08

- Moderate to significant impact to development during 2nd qtr due to RFC operational and focal point responsibilities.
- Problems were encountered with some DEM data acquired from NSSL. Re-acquired this data from the USGS.

3rd Quarter FY08

- No issues encountered during the 3rd quarter.

4th Quarter FY08

- No issues.

1st Quarter FY09

- No issues, just more time has been requested for evaluation.

2nd Quarter FY09

- No issues.

Evaluate Gridded Flash Flood Guidance (GFFG) Approaches

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Michael Smith

Objective: Quantitatively evaluate the ABRFC and OHD TF-GFFG approaches. Use observed streamflow data from small basins, grid inter-comparison techniques, and new verification data collected by NSSL. Evaluate NOAA-NESDIS percent impervious surface area (ISA) data for modeling applications in urban/suburban basins.

Milestones

Task	Due Date	Status
1. Develop joint Project Plan with NSSL for evaluating ABRFC and OHD GFFG approaches	Q2	Complete
2. Support NSSL led efforts to collect new verification data (advisory role only)	Q3	Complete
3. Finalize and check TF-GFFG codes	Q3	Complete for 1 hr GFFG
4. Complete initial assessment of impervious surface area data for small basins	Q3	This should be re-scoped as a separate project.
5. Provide TF-GFFG programs and analysis scripts to NSSL	Q3	Complete
6. Assist NSSL with running HL-RDHM and generating TF-GFFG	Q4	Complete
7. Assist NSSL in documenting results	FY09 Q2	Delayed*

*See "Problems Encountered" for 1st and 2nd Quarter FY09.

Accomplishments/Actions

1st Quarter FY08

- Revised plans due to personnel changes. Reduced the project scope. NSSL work will fill in some gaps.

2nd Quarter FY08

- Worked with NSSL on the project plan. NSSL got ABRFC involved and their feedback significantly improved the plan.

3rd Quarter FY08

- Replacement for Seann Reed hired and is rapidly coming up to speed.
- Seann visited NSSL to review project plan with JJ Gourley. JJ and students are wrapping up the 2008 SHAVE experiments (including flash flood verification data collection) and are now ready to begin analysis for this project.

4th Quarter FY08

- Provided NSSL with TF-GFFG analysis scripts and programs
- Gave guidance to NSSL in the execution of HL-RDHM and production of TF-GFFG fields

1st Quarter FY09

- NSSL has wisely re-scoped this project and put in a new AHPS proposal for FY09.

2nd Quarter FY09

- JJ Gourley at NSSL is continuing work on this project. His student, Jessica Erlingis prepared a pre-print for AMS describing the SHAVE flash flood observation data collection experiment.

Problems Encountered/Issues

1st Quarter FY08

- Seann's move to the hydraulics group has delayed this work.

2nd Quarter FY08

- None

3rd Quarter FY08

- Initial analysis of impervious percent area in Tulsa, OK, shows benefits of using this data but a more complete assessment in the broader context of rainfall-runoff a-priori parameter estimation procedures is recommended. This will require a separate project.

4th Quarter FY08

- Need to continue interacting with NSSL and Ernie Wells to gauge project progress. NSSL is currently working through some issues in comparing regenerated TF-GFFG to the archived ABRFC GFFG. The comparison is complicated by the fact that they are based on different precipitation grids.

1st Quarter FY09

- Since no AHPS resources were actually allocated to this project in FY08, only small amounts of Seann's time and some of JJ Gourley's time were available during the past year. JJ has put together an improved proposal for FY09 compared to what we had in FY08 to try to get enough resource for a student to work on this project at NSSL. OHD will likely remain a supporting role as we have no explicit resources allocated for this.

2nd Quarter FY09

- JJ is still working on this project but with limited resources so the schedule is delayed. He currently has only one undergraduate student working 10 hours per week. They plan to present initial results at the AMS Radar Conference to be held Oct. 5 - 9, 2009.

Improve Guidance for DamBreak Forecasting

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Seann Reed

Objective: Identify a nationally supportable, consensus set of dam break modeling procedures and document them in a NWS Dam Break Forecasting Guidance Document. Provide any prototype tools necessary to implement these procedures. Identify formal software engineering requirements to develop improved tools

Milestones

Task	Due Date	Status
1. Review existing dam break procedures.	FY09 Q3	On track
2. Gather information on USACE "Mapping Inundation and Production Center" activities	FY09 Q3	On track
3. Develop/evaluate procedures to convert existing dam break models (in SMPDBK, FLDWAV, or DAMBRK) to HEC-RAS.	FY09 Q4	On track
4. Identify/document best method to quickly derive cross-sections for dams with not existing models	FY09 Q4	On track
5. Coordinate with Army Corps of Engineers to get updates on the NID database and identify how these updates are used at RFCs and WFOs.	FY09 Q4	On track
6. Write guidance document for existing procedures	FY10 Q1	On track
7. Prepare training materials	FY10 Q2	On track
8. Identify software engineering requirements to develop improved tools	FY10 Q4	On track
9. Journal Publication	FY10 Q4	On track

Accomplishments/Actions

2nd Quarter FY08

- Developed HOSIP Project Plan and scheduled Gate 2 meeting.
- Collected data on several dams to use in the study.
- Developed questionnaire and began reviewing existing dam break modeling procedures.
- Continued to experiment with HEC-RAS dam break functionality.

Problems Encountered/Issues

2nd Quarter FY08 – None

FFMP Small Basin Support

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Ami Arthur, NSSL

Objective: (Objective of Project)

Milestones

Task	Due Date	Status
5. FFMPA Dataset Tier II/ III Customization Webinars	TBD	
6. Coordination of dataset sharing via the Basin Customization Repository	Ongoing	In progress
7. Provide technical assistance for dataset customization	Ongoing	In progress
8.		

Accomplishments/Actions

1st Quarter FY08

- During this quarter, the Basin Customization Repository was populated with customized datasets that had been submitted for sharing with other WFOs. We also continued to provide instructions and assistance to WFOs for several issues related to their datasets and basin customization efforts.

2nd Quarter FY08

- During this quarter, several potential workarounds/solutions for reducing the number of FFMP basin names seen in WarnGen output were investigated. We also continued to provide instructions and assistance to WFOs for their datasets and customization efforts.

Problems Encountered/Issues

1st Quarter FY08

- none

2nd Quarter FY08

- none

Routing (Hydraulics)

Transition from FLDWAV to HEC-RAS

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Develop scientific guidance and prototype data conversion tools to assist FLDWAV users transitioning to HEC-RAS. Guidance developed will include information on reproducing existing FLDWAV model results within HEC-RAS, developing new computationally stable and accurate models in HEC-RAS, and model calibration using HEC-RAS. Support requirements development and prioritization for the HEC-RAS into CHPS project.

Milestones

Task	Due Date	Status
Draft HOSIP Project Plan	Q2	Complete
Develop and analyze Tar River models	Q3	Complete
Validate HOSIP Project Plan with field hydraulics experts and prioritize requests for HEC-RAS enhancements.	Q3	Complete
Develop and analyze Columbia River models	Q3	Complete*
GoTo Meeting Status Report	Q4	Complete
Identify and test conversion of FLDWAV modeling options not used in the Tar and Columbia R. test cases.	FY09 Q1	Complete
Make data conversion programs available to RFCs	FY09 Q1	Complete*
Write technical paper and guidance documents	FY09-Q2	Complete

* Programs are complete but we have only made them available to NWRFC, NERFC, and LMRFC. We will make them available to everyone prior to the April 28th training.

Accomplishments/Actions

1st Quarter FY08

- Project team began learning HEC-RAS.
- Project team began developing Tar R models.

2nd Quarter FY08

- Seann took over as project leader.
- Developed draft HOSIP Project Plan.
- Project team continued to learn HEC-RAS (and FLDWAV and DWOPER) and DSSVue.
- Developed and tested symmetric and actual HEC-RAS models for the Tar R.
- Developed FORTRAN program to convert cross-section and bridge geometry from FLDWAV to HEC-RAS format
- Adapted LMRFC Python scripts to convert calibration data into DSS format.
- Began collecting data to build Columbia River models
- Devised and carried out key experiments to understand differences in FLDWAV and HEC-RAS models

3rd Quarter FY08

- Assisted HSEB to define task orders for HEC-RAS into CHPS software requirements.
- Fekadu took formal unsteady flow training at HEC and begin transferring knowledge to the group.
- Angelica worked on calibrating the actual Tar R model.
- Angelica studied bridge representations in the actual Tar R. model.
- Fekadu made initial conversion of a DWOPER model for the Lower Columbia to HEC-RAS.

- Fekadu obtained an alternate Lower Columbia model from HEC and began configuring it with the same boundary conditions as the Tar R model.

4th Quarter FY08

- Joanne Salerno (NWRFC) visited OHD and helped advance our model testing for the Columbia River.
- Fekadu has made excellent progress in enhancing our symmetric HEC-RAS lower Columbia model to more closely match the operational DWOPER implementation.
- Fekadu visited NERFC to assist in our understanding of other modeling issues that may not be apparent from our Tar and lower Columbia test cases.
- Seann and Angelica began outlining and filling in information in our final guidelines document (much of the content is from Fekadu's work).
- We submitted an abstract on the project for next year's ASCE/EWRI conference. Authors are Fekadu, Angelica, Seann, and Cecile.
- Fekadu, Angelica, and Seann made progress in improving Python scripts to help in model conversion, comparisons, and calibration.

1st Quarter FY09

- We added features to the fld2ras program to handle ineffective areas and the AS parameter.
- We continued to improve the calibration for our lower Columbia models.
- We started the EWRI Paper and complete it in January.
- We are making progress on the first draft of the full documentation -- "Guidelines Document". We still have the goal of completing the first draft by Jan. 31.
- We are helping to coordinate training needed for the FLDWAV to HEC-RAS transition.

2nd Quarter FY09

- Completed the Guidelines document (80 pp)
- Scheduled Steady-state and Unsteady State (CAT only) training classes.
- Solved a problem with lower Columbia simulations related to the definition of junctions that substantially improves our simulations.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY09

- None

3rd Quarter FY08

- None

4th Quarter FY08

- None

1st Quarter FY09

- Although we have made progress on HEC-RAS lower Columbia models, comparisons in simulation mode for the calibration period originally used by NWRFC will not be definitive enough to accept or reject the models as replacements for the DWOPER model in operations. We can still make some improvements in calibration mode, but we recommend setting up the HEC-RAS model within CHPS and make side-by-side comparisons in forecast mode as soon as possible. We will work towards this in FY09 Q2 and Q3.

2nd Quarter FY09

- None

River-Estuary-Ocean Modeling to Enhance Operational River Forecasting -- Chesapeake Bay Study Area

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Provide an accurate hydraulics model that extends from river mouths upstream to at least existing forecast points and beyond if necessary to achieve accuracy. Provide accurate river flow forecasts to NOS operational estuary models. Evaluate 2D/3D models or a combination of HEC-RAS and 2D/3D models to meet the goals.

Milestones

Task	Due Date	Status
1. Develop plans (identify models to use, connect with collaborators, identify resources)	FY09 Q2	In progress
2. Acquire software and initial models from collaborators	FY09 Q2	Partially complete (see problems section)
3. Build and test HEC-RAS, ADCIRC, and Mike Flood FM using historical data	FY09 Q4	Partially complete (see problems section)
4. Interim report/presentation	FY10 Q1	On track
5. Build and test SELFE model using historical data; possibly include Delft 2D/3D	FY10 Q3	Not started
6. Publish results and recommendations for operational implementation	FY10 Q4	Not started

Accomplishments/Actions

1st Quarter FY09

- Began discussions with NOS folks and participated in IOOS related meetings/presentations.
- Developed plans.
- Acquired flexible mesh data to support Chesapeake Bay modeling.
- Acquired HEC-RAS cross-section data for the Potomac River

2nd Quarter FY08

- Mashriqui made a presentation at the 63rd Interdepartmental Hurricane Conference.
- Mashriqui began building, testing, and refining a HEC-RAS model for the Potomac River.
- Mashriqui and Seann participated in more extensive discussions with NOS/CSDL.
- Mashriqui acquired an NCEP supercomputer account to facilitate ADCIRC runs.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY08

- The original proposal was to focus first on HEC-RAS, ADCIRC, and Mike Flood. We wrote a document explaining why these models make the most sense to start with. This document explained the value of using Mike Flood for science investigations to more rapidly advance our understanding of physics and serve as a proven reference (even if Mike Flood is not the operational model to be used). In house use of Mike Flood would have helped us with efficient scientific collaboration with NOS for them to design estuarine model domains with appropriate

river boundary and inflow locations. Mike Flood is preferable to other commercial models such as Delft 3D for this study because it uses a flexible mesh, finite volume technique and runs very fast on Windows PC based system compared to similar models that run on super computers. Finite volume technique is the latest in the estuarine and water quality modeling. CSDL/NOS in future plan to utilize finite volume based models (such as FVCOM that runs on super computers). However, there is no funding to purchase Mike Flood software or support; therefore, the initial 2D model to be evaluated will be the academic model ADCIRC. Some comparisons can be made to the operational NOS CBOFS 3 model, but the CBOFS3 mesh does not extend far enough inland to meet the goals of this study. We hope to add other models to the study as resources allow. We will use the commercial model Sobek model for the Wind into HEC-RAS study, but Sobek is not suitable to meet the goals of this project.

- To meet new requirements, we have discussed splitting our initial REO related efforts into two areas: (1) this Chesapeake project focused on improving our understanding of what physics and computational power is required for improving services at RFC forecast points and between these points and estuaries, (2) working towards a CERIS Pilot for Pamlico Sound North Carolina that runs on operational platforms (e.g. NCEP computers and with CHPS at RFCs). It will take time and coordination to develop plans for the second project. More extensive efforts than anticipated on this second project will likely slow progress on the Chesapeake Bay modeling described in this report.

Incorporate Wind Information into HEC-RAS

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Define specific NWS requirements for adding wind modeling capabilities into HEC-RAS and provide them to HEC. Recommend source(s) of wind data, the method to apply 2D wind data in a 1D model, and the shear stress algorithm.

Milestones

Task	Due Date	Status
1. Collect data	FY09 Q2	Nearly complete
2. Build models (HEC-RAS and Sobek)	FY09 Q3	On track
3. Calibrate models during low wind period	FY09 Q3	On track
4. Validate models	FY09 Q4	On track
5. Provide requirements to HEC	FY10 Q1	On track
6. Publish Results documentation: presentation and paper	FY10 Q1	On track

Accomplishments/Actions

1st Quarter FY09

- Presented and discussed plans with AHPS Theme Team
- Acquired HEC-RAS cross-section data for the Potomac River
- Investigated sources of wind data

2nd Quarter FY09

- Acquired Sobek license and began studying Sobek, including its wind modeling capabilities.
- Mashriqui began building, testing, and refining a HEC-RAS model for the Potomac River.
- Developed HOSIP project plan and passed Gate 2 meeting with minor revisions required.
- Acquired streamflow, stage, and tide data.

Problems Encountered/Issues

1st Quarter FY09

- None

2nd Quarter FY09

- Delays in getting Sobek license.

Dynamic Inundation Mapping

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Develop a method to quantify the limitations of static inundation mapping versus dynamic. Test the method at several NWS forecast points. Evaluate current technologies to generate inundation maps

Milestones

Task	Due Date	Status
1. Develop methods to compare static and dynamic mapping approaches	FY09 Q2	Complete
2. Test method for selected North Carolina static inundation mapping points	FY09 Q3	On track
3. Finalize documentation for North Carolina points	FY09 Q4	On track
4. Begin evaluating available technologies for dynamic mapping	FY09 Q4	Not started

Accomplishments/Actions

1st Quarter FY09

- Prepared dynamic models
- Began developing evaluation methodology

2nd Quarter FY09

- Prepared a pre-print for ASCE EWRI focusing on Tar River analysis.
- Presented methodology at Federal ESRI User Conference in Washington, D.C.
- Keren Cepero (graduate student from NC State) joined us for the Spring Semester. She began building a HEC-RAS model for the Neuse River so that we can expand our sample of analysis points.

Problems Encountered/Issues

1st Quarter FY09

- None

2nd Quarter FY09

- It has taken longer than expected to acquire cross-section data for the Neuse but we are still on track.
- The Neuse River model will depend more on the accuracy of lateral inflows from the hydrologic model compared to the Tar River. The radar-based precipitation data we would like to use may not provide good simulations for time periods of interest such as Hurricane Floyd. We are working to address this.

Hydrologic Models

Physically-Based Modifications to the Sacramento Model

Core Goal: Improve the forecasts by improving hydrologic models

Management Lead: Mike Smith

Objective: The objectives of this work are to investigate further modifications to the Sacramento model. These include: investigate/modify SAC model to run over cascading planar elements; better treatment of vegetation, perhaps from the NCEP LSM model; treatment of old water/new water in runoff process; treatment of re-infiltration of runoff, etc.

Milestones

Task	Due Date	Status
1. Evaluate need for adding vegetation component to Sac Model. This could include: 1) Evaluate NOAA LSM treatment of vegetation in context of DMIP 2 in OK and Western basins. 2) Evaluate benefit of better PE estimates versus adding vegetation component (i.e. collaborate with Martha Anderson of Beltsville, ARS; get NCEP's PE estimates, evaluate NASA Marshal PE).	FY07 Q4	Done via DMIP 2 and investigation of dry area SAC parameterization.
2. Identify basins with clear evidence of channel re-infiltration. Coordinate with Dave Goodrich of ARS for this; set up RDHM runs for analysis	FY07 Q4	Delayed
3. Modify RDHM to test approach if necessary.		
4. Evaluate need for treatment of Mean residence times and old/new water as per seminar by Jeff McDonnell.	FY07 Q4	Delayed
5. Evaluate new NASA PE time series to assess value for hydrologic simulations.	FY08 Q3	In progress
6. Investigate linkage of sub-surface flows in gridded Sac model	FY08 Q4 FY09 Q4	In progress
7. Modify SAC-HT for better evapotranspiration treatment	FY09 Q4	In progress

Accomplishments/Actions

1st Quarter FY07

- Initiated new project for physically-based modifications to the Sacramento Model

2nd Quarter FY07

- Time estimates developed for potential modifications to SAC-SMA. Identified NCEP actual PE values as possible path. Evaluation of Blue River in Oklahoma for channel re-infiltration not conclusive. McDonnell commented during the seminar on 'old water' that this concept is probably most geared towards hillslope runoff processes.

3rd Quarter FY07

- Identified Blue River in Oklahoma as one that has channel losses from karst formations. Contacted Dr. Todd Halihan, a hydrogeologist from Oklahoma State University who is very familiar with the Blue River and springs and karst formations. Requested any data for this basin.

4th Quarter FY07

- Provided Guidance to NASA researchers on Joint OHD/NASA project for PE estimates. This work will test the combination of MODIS satellite-derived cloud mask information with ASOS ceilometer data to derive a replacement for the manual sky cover observations required for SYNTRAN. Initial interim results look promising.
- Obtained many papers etc from Dr. Todd Halihan on the hydrogeology of the Blue River basin. Sent one presentation to ABRFC for their use. Hopefully, these will provide useful data.

- Some DMIP 2 participants used the NARR data for evaporation; must evaluate these results

1st Quarter FY08

- Shane Sheldon began analysis to compare the impacts of several different PE sources on simulations in the Blue River.

2nd Quarter FY08

- Found USGS data for the spring in the Blue River (largest in Oklahoma). Sent data to ABRFC. Shane Sheldon tried various values of SAC 'side' parameter to improve simulations for this basin.
- Evaluation of daily PE time series is underway on two basins in Oklahoma: Blue River and Black Bear Creek. The Blue River is somewhat problematic so we switched to the Black Bear Creek. Analyzing 3 PE time series: derived from ASOS cloud height, MODIS cloud mask, and combination of ASOS and MODIS. Advantages compared to monthly climate PE approach not initially obvious, but the PE time series are certainly within a reasonable range.
- Dr. Soroosh Sorooshian of the U. California at Irvine will send a PhD student to work at OHD over the summer. One aspect of the work will be to develop sub-surface linkages of gridded Sac elements.

3rd Quarter FY08

- PhD student Behnaz Kahkbaz from UCI started June 9 at OHD for summer internship. She and Victor developed a physically-based strategy to use the soil moisture levels computed by SAC-HT and channel invert elevations to determine the proportion of interflow and baseflow that would be routed to the downstream grid cell's storages. The SAC fland1.f subroutine was modified for proof-of-concept testing. Hypothetical tests of the modifications showed reasonable results.

4th Quarter FY08

- Concept and initial results of using SAC-HT to model sub surface flow connections presented at DOH 2008 conference. Work continued at UC Irvine.
- Victor Koren developed outline for modifying the SAC-HT model to account for better treatment of vegetation, canopy, and evapotranspiration losses using experience from Noah land surface model. This will be submitted as an AHPS/WR FY09 proposal. This modification is primarily focused on work in dry climates.

1st Quarter FY09

- Behnaz Khakbaz modified the HL-RDHM to generate a grid cell water exchange for primary and supplemental baseflow based on a concept developed earlier. Started tests with the new structure.
- Victor presented results of his SAC *a priori* parameterization work in dry areas and the deficiency of the SAC model regarding evaporation. Presentation made to RFCs and OHD.
- Victor prepared plan for modifying SAC model for refined evapotranspiration approach. Mike presented plan to AHPS/Water Resources Innovation Theme Team.

2nd Quarter FY09

- SON approved for modifying SAC-HT for advanced evapotranspiration; HOSIP Stage III project plan begun. OHD (Victor Koren) provided guidance and SAC-HT code to U. Washington for their unified land surface model consisting of SAC-SMA and the Noah models.
- Daily PE 4km grids delivered to OHD for 2006 and 2007 for Oklahoma and Texas. Evaluation underway. Initial spatial analyses indicate that a better method is needed to interpolate ASOS observations of meteorologic variables to a grid.
- Linkage of sub-surface elements: Victor Koren provided much guidance to UCI researcher Behnaz Khakbaz. She finished coding of a water exchange component into HL-RDHM. Generated needed parametric data to run the new RDHM version for the Eldon basin. She is planning sensitivity tests using Eldon data. Ms. Khakbaz generated many simulations and experiments noting the sensitivity of model performance to the relationship of channel invert to SAC lower zone storages.

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07

- Hydro group is currently managing 38 major tasks...need prioritization and final budget resolution before moving ahead with new projects.

3rd Quarter FY07

- Hydro group is currently managing 38 major tasks...need prioritization and final budget resolution before moving ahead with new projects.

4th Quarter FY07 - None

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 – Some delays in receiving time series from NASA Marshall SFC of gridded PE derived from MODIS and ASOS cloud observations. These are expected FY09 Q1.

1st Quarter FY09

- Continued delays in receiving gridded PE data from Marshall SFC.

2nd Quarter FY09

- Continued delays in receiving gridded PE data from Marshall SFC.

Calibration - Complete IDMA Study

Core Goal: Improve the forecasts by improving hydrologic models

Management Lead: Mike Smith

Objective: The objective of FY08 work will be to continue and finish a scientific study to evaluate the impacts of not performing (historical) data quality control procedures on precipitation data during hydrologic model calibration.

Milestones

Task	Due Date	Status
1. Complete Eric Anderson's initial evaluation and put on HL web site	Jan. 27, 2005	Complete
2. Develop literature review to establish how NWS procedures fit into the published literature of accepted practices.	12/31/2004	Complete
3. Develop outline of journal paper.	12/31/2004	Complete
4. Obtain data for additional analyses	FY08 Q3	On track
5. Calibrate basin with uncorrected/corrected data	FY08 Q3	On track
6. Analyze calibration results	FY08 Q4	On track
7. Develop and deliver recommendations for the RFCs	FY09 Q1	Delayed.

Accomplishments/Actions

1st Quarter FY05

- Determined that the NWS double mass analysis procedures fit well into the body of existing quality control procedures for historical data. Climate-change researchers regularly use such procedures and stress their importance.
- Eric Anderson's initial work shows that biases can result from not corrected data for man-made inconsistencies.

2nd Quarter FY05

- Given problem described in Q1 above, found study basin with hourly discharge data and a nearby station with a documented station move.
- Found more studies in the literature on the effects of calibration data on model calibration.
- Discussed with Seann Reed a strategy to test the effects of calibration data quality on model forecasts.

3rd Quarter FY05

- Found another peer-reviewed journal article to support the need for the analysis.
- Began hourly calibration of ELDO2 using MAP time series with and without the consistency correction.

4th Quarter FY05

- Used data from the current IDMA study to help evaluate the MPE-Reanalysis data to be used for DMIP 2.

1st Quarter FY06

- Will continue calibration of the basin in conjunction with calibration of basins for DMIP 2

2nd Quarter FY06

- Work resumed after the lumped calibrations for DMIP 2 begun.

- Found journal papers confirming the test approach and need for such investigations (Journal of Hydrology, Vol. 320, pages 62-86).

3rd Quarter FY06

- Began to revisit this project with calibration of DMIP 2 basins.

4th Quarter FY06 - N/A

1st Quarter FY07

- Calibrated ELDO2 test basin for DMIP 2 with MAPX data and sent to Eric Anderson for review. These parameters will help evaluate the parameters derived via calibration with raingauge data. Studied paper on calibration with MAPX and raingauge data as a surrogate to this problem (Calibration of a rainfall-runoff model using radar and raingauge data, Adv. In Geosciences, 2005)

2nd Quarter FY07

- Updated the HOSIP documents to reflect the current status of this project.

3rd Quarter FY07 - N/A

4th Quarter FY07 - N/A

1st Quarter FY08 - N/A

2nd Quarter FY08

- Analyzed gauge only gridded precipitation for the North Fork American River for the 2002 -2006 time period and found consistency issues that resulted in time-varying model biases. Will try to use these data to restart the study. Also found journal paper on the impact of biased and randomly corrupted inputs on the efficiency and the parameters of watershed models. The paper showed: 1) random errors in precipitation significantly affect model performance and parameter values and 2) systematic errors in rainfall time series (biases) when large enough can be very detrimental to model performance. Will send paper to RFC's

3rd Quarter FY08

- None this period

4th Quarter FY08

- None this period

1st Quarter FY09

- Naoki wrote draft paper on DMIP 2 precipitation data inconsistencies in the North Fork American River basin. Reviewed by Hydro group. Mike provided Naoki with references on effects of inconsistent data on model calibration. Mike, Victor, and Naoki discussed continuation of data correction problem by Naoki. Mike will review status of work on Baron Fork at Eldon, OK in order to give to Naoki.

2nd Quarter FY09

- Naoki and Victor continued to revised draft paper on impact of QPE bias in model calibration and simulation using the North Fork American River.

Problems Encountered/Issues

1st Quarter FY05

- Discovered that it is difficult to calibrate a basin using mean daily flow given minor changes in the MAP time series (caused by lack of consistency corrections). Proposed solution is to use hourly computations and data.

2nd Quarter FY05 - None

3rd Quarter FY05 – None

4th Quarter FY05

- Work delayed as Mike was assigned to lead River Mechanics Group as well as Hydrology group. George Smith ok'd the delay.
- Work delayed to focus on 1) DMIP 2 cost estimates for funding from Water Resources Program (No AHPS funding for DMIP 2 granted), 2) DMIP 2 precipitation forcing problem: MPE Reanalysis data found to be lacking and needed more analysis.

1st Quarter FY06

- Will continue calibration of the basin in conjunction with calibration of basins for DMIP 2.

2nd Quarter FY06 - None

3rd Quarter FY06

- Task put on 'back burner' due to crush of other projects.

4th Quarter FY06

- Task delayed in order to launch DMIP 2 western basin experiments. Will continue this task when calibrating the DMIP 2 basins.

1st Quarter FY07

- Task delayed due to tasks with higher priority

2nd Quarter FY07

- Task delayed due to tasks with higher priority

3rd Quarter FY07

- Task delayed due to tasks with higher priority

4th Quarter FY07

- Task delayed due to tasks with higher priority

1st Quarter FY08

- Task delayed due to tasks with higher priority

2nd Quarter FY08

- Task on hold due to loss of 3 group members and other higher priority projects.

3rd Quarter FY08

- Task on hold

4th Quarter FY08

- Task on hold

1st Quarter FY09

- None

2nd Quarter FY09

- Delays getting journal paper through group review.

Software Refresh

Community Hydrologic Prediction System (CHPS)

Core Goal: Enhance the usability and/or internal workings of existing software

Management Lead: Jon Roe

Objective: Provide an improved software infrastructure for operational use at RFCs, as a replacement for the existing NWSRFS, and which will meet the future forecasting needs of all RFCs.

FY09 Milestones (from FY09 Workplan):

Task/Subtask FY09 Milestones	FY09 Due Date	Current Status
1 CHPS BOC, including HEC-RAS		
1.1. Partial implementation of new operations and interactive forecasting capability in FEWS	Q1	Complete
1.2. CHPS Preparation Workshop #2	Q1	Complete
1.3. Installation of test configurations at CAT RFCs on new hardware	Q2	Complete
1.4. Acceptance testing of new software	Q2	Complete
1.5. CHPS migration training for CAT RFCs	Q2	Complete
1.6. CHPS Preparation Workshop #3	Q2	Complete
1.7. Complete first stage of migration of NWSRFS to CHPS for CAT RFCs	Q3	Started
1.8. CHPS Implementation Workshop #1	Q3	Not started
1.9. Complete second stage of migration of NWSRFS to CHPS for CAT RFCs	Q4	Not started
1.10. CHPS Implementation Workshop #2	Q4	Not started
1.11. HEC-RAS with FEWS: Kick-off meeting	Q1	Complete
1.12. HEC-RAS with FEWS: demo of FEWS display mockups	Q1	Delayed until Q3
1.13. HEC-RAS with FEWS: Demo FEWS configuration available for NERFC	Q1	Delayed until Q3
1.14. HEC-RAS with FEWS: Draft documentation	Q1	Delayed until Q3
1.15. HEC-RAS with FEWS: Adapter training to HEC staff in Davis, CA	Q2	Delayed until Q3
1.16. HEC-RAS with FEWS: Demo of FEWS-based displays & acceptance at NERFC	Q2	Delayed until Q3
1.17. HEC-RAS with FEWS: Final delivery (adapter software & documentation)	Q2	Delayed until Q3
1.18. HEC-RAS: Finalize Tar R. modeling	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.19. HEC-RAS: Finalize lower Columbia modeling	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.20. HEC-RAS: Finalize conversion tools	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.21. HEC-RAS: Write Guidelines document	Q2	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.22. HEC-RAS: Learn CHPS version of HEC-RAS	Q2	Refer to report on Core

		Goal 6 "Transition from FLDWAV to HEC-RAS"
1.23.HEC-RAS: Scientific paper for ASCE/EWRI Conference	Q2	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.24.HEC-RAS: Develop and deliver HEC-RAS conversion training	Q3	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.25.HEC-RAS: Update Guidelines document	Q4	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"

Accomplishments/Actions:

1st Quarter FY07

- Key minimum requirements for demo system were defined. RFCs/basins were selected for the pilot. Draft versions of the HOSIP Concept of Operations (CONOPS) and Plan documents, co-developed by RTi and Delft, were delivered. HOSIP Gate 2/Gate 3 (combined) is expected to be held in January.
- The original plan for the pilot was to demonstrate functionality at one RFC. The CAT members agreed that there would be greater value using 2 RFCs rather than one. This means that Task 3 (Implement the FEWS pilot at other RFCs) has effectively begun.
- For risk reduction purposes, OHD also fired up a small team of developers to implement the new Heat Transfer version of the SAC-SMA/Frozen Ground model as part of the pilot demonstration. Work on this sub-project has begun.
- OHD installed the first version (0.0) of ADE locally, and began investigation of its capabilities and features. Several OHD developers, including the CHPS SOA expert, will attend ADE training in January 2007.

2nd Quarter FY07

- The CHPS FEWS Pilot project successfully passed HOSIP Gates 1 and 2 in January.
- In February OHD delivered a re-engineered Java version of OHD's new SAC-SMA Heat Transfer (HT) model, with associated adapter source code, to Delft for inclusion in the pilot.
- Delft began the installation and set-up of FEWS at NCRFC and NWRFC in March. A demonstration of the pilot system running at NWRFC is planned for April.
- OHD initiated a new task in March with Apex Digital Systems to conduct an assessment of the FEWS pilot system. The task will begin with the demo at NWRFC in April and is expected to run for 6 months. Apex will work with the pilot RFCs to develop a set of success criteria, and to evaluate the pilot system against those criteria. The assessment will provide information required in order for the CAT and OHD management to make the final decision concerning FEWS for CHPS.
- Jon Roe and Chris Dietz began a series of discussions with Raytheon in March to address the nature of an interface between AWIPS II and CHPS (FEWS). Raytheon expects to begin analysis of the FEWS pilot system in July with a view to identifying future work for OHD and Delft.
- OHD's SOA expert, Sudha Rangan, attended AWIPS Development Environment (ADE) training in January. This places her in the key position of having familiarity with both FEWS and AWIPS II, and will provide OHD with a means to assess Raytheon's proposal.

3rd Quarter FY07

- Installation of the CHPS FEWS Pilot system at NWRFC and NCRFC occurred this quarter; Delft demonstrated the system in Portland, OR during the week of April 15.
- Beyond the success of the demonstration, CAT members recognized immediately that additional functionality is required for the Pilot system to be viable, and for the Pilot evaluation to be meaningful. In response to this, HSEB initiated a contract task with Delft through RTi to implement the following:
 - Installation of the Pilot at ABRFC

- Develop a MODs-like capability (the “what-if scenarios” are inadequate for operations)
 - Configure all Pilot sites as client-servers, not standalone as now
 - Provide additional segment definitions for the Santiam River for NWRFC
 - Provide more in-depth training to all Pilot sites
- HSEB expects Delft to begin work on these additional tasks in Q4.
- OHD began implementation of the lumped SNOW-17 model for the FEWS Pilot. Completion is targeted for Q4.
 - Apex distributed an early version of the Pilot evaluation criteria document to the CAT; however in the absence of the additional functionality described above, the CAT members suggested that the evaluation effort be postponed until all functionality is complete.
 - HSEB completed negotiations with Raytheon to define the interface between AWIPS II and CHPS. Raytheon is expected to begin the task in Q4.
 - After a series of discussions with HSMB and HEC, HSEB submitted the necessary paperwork to begin the task of incorporating the USACE HEC River Analysis System (HEC-RAS) into CHPS. Apex will conduct the analysis; OHD expects HEC to do most, if not all, of the software development.
 - In May the Experimental Ensemble Forecast System (XEFS) Design and Gap Analysis Team, led by DJ Seo (HSMB) and Rob Hartman (CNRFC) presented to the Director of OHD, Gary Carter, a report entitled “The Experimental Ensemble Forecast System (XEFS) Design and Gap Analysis: Report of the XEFS Design and Gap Analysis Team”, dated May 11, 2007. Following acceptance of the report’s recommendations, Gary Carter assigned Execution Management responsibility to HSEB, and created an Oversight Group (Rob Hartman, DJ Seo, Mary Mullusky, Chris Dietz). The XEFS will be implemented using the CHPS software architecture. An implementation plan will be prepared during Q4.

4th Quarter FY07

- Conducted a kick-off meeting for the CHPS FEWS Pilot Enhancements project on August 15. Demonstration and workshop is now planned for the week of December 17 2007 at NCRFC.
- Conducted a design review for the proposed MODs-like capability in the Pilot system. Discussions resulted in some changes identified for the Sac-SMA Pilot implementation, to be completed by Q1 FY08.
- Delivered SNOW-17 software to Delft for inclusion in the Pilot system.
- Pilot configurations and set-up for ABRFC have begun.
- Began changes to Pilot version of Sac-SMA to accommodate PE time series needed for the Illinois River at ABRFC; completion scheduled for Q1 FY08.
- Delft met with Raytheon in Omaha, NE at the end of September to discuss the question of an interface between Delft-FEWS AWIPS II. OHD expects to receive a proposal for review in early November.
- During the week of July 9, Delft led an installation at CNRFC bringing all collaborative components for the Res-Sim project together in one place for the first time; i.e., Delft-FEWS configured for CNRFC, an early Linux version of the ResSim from HEC, and a modified version of NWSRFS from Apex. The installation revealed some missing functionality needed for NWSRFS, which HSEB provided at short notice, and which was delivered to CNRFC during August.
- Delft sent a hydrologist to CNRFC during the week of September 17 to troubleshoot an outstanding ResSim issue on-site. The cause of the problem turned out to be configuration and environment, not software.
- Acceptance testing at CNRFC for the ResSim project has been delayed until mid-November.
- OHD and HEC finalized the Memorandum Of Agreement (MOA) that will enable us to work jointly on the HEC-RAS project. Funds for Phase 1 (the analysis & design phase) were transferred to HEC at the very end of Q4 FY07.
- HSEB (RSIS) completed the Experimental Ensemble Forecast System (XEFS) High Level Analysis & Design document. The Analysis & Design document will be shared with the XEFS Oversight Group for review, followed by the XEFS Implementation team.
- HSEB has now begun an XEFS Implementation Plan associated with the draft Analysis & Design. The plan is required for FY08 funding proposals. The XEFS Implementation project will be addressed by the Core Goal Planning Team for Forecast Uncertainty (i.e., Ensembles).

1st Quarter FY08

- For more detailed information, please visit the CHPS news and activities page on the Web at: <http://www.nws.noaa.gov/oh/hrl/chps/news.html>.
- Apex Digital Systems and Dr. Michael Piasecki from Drexel University submitted to OHD a HydroXC proposal for the FY08 Hydrology budget that would build upon work completed in previous fiscal years, and help make the HydroXC work successful and self-sustaining.
- At a workshop hosted by the NCRFC in Chanhassen, MN during the week of December 17, Delft Hydraulics (now Deltares) presented and demonstrated the final version of the CHPS FEWS Pilot system to a group of HICs and RFC hydrologists.
- Based on the CHPS FEWS Pilot system, the CHPS Acceleration Team (CAT) is now satisfied that FEWS is a comprehensive platform which can be adapted to meet the current operational needs of NWS RFCs (i.e., is a suitable foundation for an NWSRFS replacement); and additionally has the potential to meet future needs of CHPS as a whole. The CAT delivered a final recommendation report to Gary Carter summarizing their findings. The NOAA Hydrology Program Manager accepted the findings and endorsed the implementation of FEWS for CHPS.
- Raytheon concluded their analysis of CHPS (FEWS), and delivered a proposal to OHD at the end of October for an approach to the CHPS-AWIPS II interface.
- Acceptance testing of the new ResSim at CNRFC occurred during November. An adequately functional version of ResSim was installed, along with OHD's/Apex's enhanced version of NWSRFS.
- Phase 1 of the HEC-RAS into CHPS project began with a kick-off conference call in December where a proposed project schedule was discussed.
- On October 19 HSEB submitted a "High Level Analysis and Design" document to the XEFS Implementation Team for review.
- In December HSEB held a meeting to address feedback received on the XEFS document. However the discussion prompted a re-think of the implementation strategy, which will now be based on Delft-FEWS in light of the CAT recommendation for CHPS.

2nd Quarter FY08

- On January 1 Delft joined forces with several other Dutch water-focused institutes to form Deltares. Visit http://www.deltares.nl/xmlpages/page/deltares_en for more information.
- The CAT delivered its recommendation report to Gary Carter on January 9; the recommendation to proceed with FEWS as the infrastructure component for CHPS was approved. Chris Dietz was named as the CHPS Implementation project leader.
- A successful HOSIP Gate 4 for the CHPS FEWS Pilot Enhancements project was held on February 20.
- The first draft high-level implementation plan was developed; the CAT is holding weekly conference calls to refine details of the plan. A planned 2-day workshop to accelerate development of the plan was postponed at the last minute due to increased flood forecasting operations at NWRFC.
- Karel Heynert from Deltares visited OHD in Silver Spring on February 21, 2008, to discuss and refine the proposed implementation and migration schedule.
- Apex held a series of fact-finding interviews with each of the CAT RFCs, resulting in a report delivered to OHD on March 24 entitled "FEWS Pilot Results".
- OHD HSEB developers have begun work on 7 NWSRFS model operations: CONS_USE, LAG/K, RES-SNGL, SARROUTE, SSARRESV, TATUM, and UNIT-HG. The PAL for these activities is Joe Gofus.
- HSEB initiated the process of securing access to Deltares through the NWS AWIPS contract with Raytheon.
- Deltares and OHD traveled to LMRFC in February to discuss functional requirements for the HEC-RAS capability in CHPS. OHRFC also attended. The Deltares-OHD team then traveled on to Davis, CA to meet with USACE HEC and its contractor Resource Management Associates (RMA); RMA is the contractor that built the Corps Water Management System (CWMS) in collaboration with HEC. The goal of the meeting in Davis was to discuss potential solutions. Delft, HEC, LMRFC came to an agreement concerning the overall technical solution, which allowed Deltares and HEC to draw up technical proposals; the Deltares proposal was reviewed

by the Hydraulics team on March 25. Phase 1 of the project is now complete. Phase 2 - implementation of the proposed solution - will begin once contracts/MOAs are in place with Deltares and HEC.

- The HydroXC effort did not receive any FY08 funding; all work has now been placed on indefinite hold

3rd Quarter FY08

- The CAT met in Portland (NWRFC) on May 1-2 to accelerate progress on planning activities. An implementation plan for CHPS migration was completed.
- In mid-June Rob Shedd, the Development and Operations Hydrologist (DOH) at Northeast RFC (NERFC), became a CAT member. NERFC is now a "CHPS forerunner" site. John Halquist remains a CAT member, but now represents NOHRSC.
- On March 24 Apex Digital Systems, Inc. (Apex) delivered the final version of their document entitled "FEWS Pilot Results".
- Deltares made significant progress on the migration mapping document during a visit between Deltares and OHD the week of April 14.
- The CAT identified requirements for a CHPS Baseline Operational Capability (BOC), defined to be the minimal set of functionality required at the CAT RFCs to migrate to CHPS. BOC document for the CAT RFCs is now complete.
- Joe Gofus was assigned leadership of the OHD CHPS software development team which will focus on converting NWSRFS models to CHPS.
- A CAT-OHD-Deltares workshop was held June 17-19 in Silver Spring, MD
- Karel Heynert from Deltares gave a Delft-FEWS presentation to the Integrated Water Resources Science and Services (IWRSS) workshop participants on June 16.
- Deltares delivered to the CAT a proposed set of hardware specifications.
- HSEB submitted to NOAA Procurement a request for quotes based on final specifications drawn up by OHD, OCWWS, and Deltares for a partial system (i.e., without a duty standby, and without an offline system). The goal is to install this partial CHPS system at CAT sites in October 2008.
- HSEB initiated a "chps_info" mailing list to broadcast information and attempt to familiarize subscribers with terminology; also a new rfc.chps@noaa.gov email account was created as a supplemental way of disseminating CHPS information.
- Deltares is waiting for authorization from NOAA Procurement to proceed with work on the HEC-RAS adapter. Funds for HEC were transferred to the USACE at the end of June; HSEB is waiting for HEC to advise when they can begin work.

4th Quarter FY08

- After Raytheon declined to submit a joint proposal with Deltares for CHPS implementation under the AWIPS contract, NOAA proceeded with a sole source solicitation from Deltares (ref. solicitation number NWWC0000-8-39992 on FedBizOpps.gov). A contract was awarded on September 17.
- CHPS web page (<http://www.nws.noaa.gov/oh/hrl/chps/index.html>) was re-designed and updated in August.
- CHPS Preparation Workshop #2 was held at NERFC in Taunton, MA during the week of September 29.
- Deltares led a Usability Analysis meeting during the week of August 4, beginning the process of designing a user interface for Delft-FEWS that will meet the need of NWS forecasters. Initial screen mock-ups were developed and presented to representatives from all 4 CAT RFCs.
- HSEB modified the NWSRFS "ofsde" program to deliver files for CHPS. The new version was successfully tested at NWRFC.
- HSEB began implementation of changes to support run-time modifications (MODs) based on design information provided by Deltares.
- HSEB completed the purchase for prototype hardware, to be delivered to the CAT RFCs in October.
- HEC began work on the changes to RAS; the task for Deltares through the RTi/AHPS contract was awarded. RTi has scheduled a kick-off meeting for the start of October. HSMB continued to make good progress with their task on the project (see status report for "Transition from FldWav to HEC-RAS").

- Deltares visited NERFC on August 14-15 to provide first level FEWS training to RFC staff. Some additional training was provided to NERFC after the Workshop #2. NERFC will now also be the primary site for testing the HEC-RAS implementation in CHPS.
- On September 8, HSEB made its first delivery to Deltares of most of the migrated models; Deltares tested them in their facility during September.
- The NWS Employees Organization (NWSEO) nominated Ron Horwood, Senior HAS Forecaster at NERFC, to be the bargaining unit's representative to the CHPS project.
- HSEB presented a CHPS project status update to OSIP Gate 3 on September 23.

1st Quarter FY09

- CHPS prototype hardware delivered and installed at all 4 CAT RFCs. "Mod note" developed by OCWWS HSD (Randy Rieman).
- FEWS server software installed at NERFC and NWRFC (ABRFC and CNRFC due next quarter).
- CHPS Data Forcings team created to develop short and long term strategies for providing grids and other forcings to CHPS (lead: Mark Glaudemans)
- Harold Opitz, Joe Intermill (both NWRFC), and Ron Horwood (NERFC) attended Software Acceptance Testing in Silver Spring. Goal was for Deltares to demonstrate to OHD that BOC operations migrated from NWSRFS work the same when plugged into FEWS as when run independently of FEWS (i.e., standalone). Individual operations did well, and the source of most discrepancies was identified. Forecasters were additionally able to run catchments end-to-end using FEWS, although the results were not always correct due to the known individual operation discrepancies.
- Jon Roe gave a CHPS presentation to the new Director of OS&T (Don Berchhoff). Berchhoff requested more information on the hardware issue (ref. Issue 4Q FY08), which was delivered to him on Dec 31; OHD expects OS&T follow-up during January.
- HEC delivered a Linux-based version of the RAS to Deltares on Dec 8; this now permits Deltares to finalize the RAS-FEWS adapter development and testing.

2nd Quarter FY09

- OCWWS HSD completed hardware and software installations at remaining CAT RFCs.
- Began next phase of introducing other RFCs to CHPS. 9 follow-on RFCs now referred to as "CAT-II"
- OHD provided monthly status briefings to CAT-II and Regions on January 8, February 12, and March 12
- OHD supported the CAT members on "CHPS Day" during the national HIC conference on February 26
- Weekly conference calls with CAT-II initiated on March 10 (led by Rob Hartman, HIC CNRFC); focus has been getting requirements captured ("BOC-II")
- CHPS Migration training (for the CAT) held at the NWSTC, Kansas City, MO the week of February 9. This was followed by on-site visits by Deltares to CAT RFCs to help with migration kick-off
- Formal start of CAT Migration from NWSRFS to CHPS: 2/17/09. At end of Q2, ABRFC had completed migrating ALL their NWSRFS segments!
- CHPS Preparation Workshop #3 (for the CAT) was held in Silver Spring, MD the week of January 26
- CHPS Implementation Workshop #1 (for the CAT) was held at CNRFC in Sacramento, CA the week of March 30
- New infolists set up: cat_2 (for CAT-II information sharing); chps_ops (for migration support and information sharing). New operational support email set up: nws.chps_support@noaa.gov
- OHD delivered first release of modeling software for CHPS; Software Acceptance Testing (SAT) for integrated package (FEWS + OHD software) scheduled for week of April 6
- OHD began work on models required by CAT-II sites ("BOC-II")
- CHPS Data Forcings team met approximately weekly; CAT has focused heavily on the implementation and use of GFE, MPE/DQC, and local applications for BOC. OHD also began work on a temperature processing software application. OHD began to consider requirements for and approaches to CHPS forcings for the CAT-II RFCs.

- Deltares resumed work on the expanded FEWS Interactive Forecast Display (IFD) for the CHPS project. Design meetings (screen mockups, prototypes) began on March 4.
- OHD and Deltares began to document requirements for a CHPS Calibration capability, which will be implemented using a new Application Programming Interface (API) to the FEWS infrastructure provided by Deltares.
- Dates for HEC-RAS training were finalized as follows: basic/steady-state provided by HEC in Davis, CA for all CAT and CAT-II RFCs – April 13-17; advanced/unsteady-state provided by OHD HSMB in Taunton, MA for CAT – April 28-May 1 (lecture portions to be presented as webinars, so CAT-II can also attend)
- Issues (see 2nd Quarter FY09 below) resulted in the agreement between OHD and Deltares to include displays for HEC-RAS as part of the general CHPS Interactive Forecaster Displays
- A “national CHPS workshop” evolved into two events: 1. “buddy visits” where CAT RFCs travel to their partner RFCs with Deltares and OHD during May, June, and July to introduce the CAT-IIs to CHPS; 2. A CAT-II Preparation Workshop #1 in September. CAT-CAT-II partnerships are as follows: NERFC/MARFC & OHRFC; ABRFC/WGRFC & LMRFC & SERFC; NWRFC/APRFC & MBRFC; CNRFC/CBRFC & NCRFC.

Problems Encountered/Issues:

1st Quarter FY07 - None

2nd Quarter FY07 - None

3rd Quarter FY07

- The Pilot Evaluation task has been postponed until after the next set of Pilot enhancements have been deployed. This delays the key decision concerning adoption of FEWS for CHPS until FY08 Q2.

4th Quarter FY07

- The extension of AWIPS OB8 and OB9 activities caused a 2 month delay to the start of the XEFS project. Originally expected to begin on September 1, the project will now begin on November 1.

1st Quarter FY08

- An outstanding issue concerning ResSim’s ability to execute a warm start in the manner expected by RFC forecasters was never resolved. As the necessary changes to ResSim would be extensive, CNRFC agreed that their plan to move forward with ResSim in their operations could proceed with minor impact. The USACE HEC will submit a proposal to the YCWA to make the necessary design and code changes to ResSim. This HEC activity will delay Phase 2, which is expected to add processing of ensemble forecasts in ResSim.

2nd Quarter FY08 – None

3rd Quarter FY08

- As we approach the final quarter for FY08 we expect NOAA Procurement to be slow to respond to CHPS-related spending requests. Delays may jeopardize the CHPS schedule.
- The CAT continues to struggle with ways to involve all RFCs. GoTo meetings, Webinars, and the like have been suggested but have never materialized. The lack of a signed contract between OHD and Deltares hinders HSEB’s ability to task them. The DOH workshop in July holds some promise.

4th Quarter FY08

- Although the Hydrology program purchased the initial prototype hardware for CHPS, it is unclear what the future strategy will be, given that the AWIPS budget through 2012 contains no provision for increased computing resources at RFCs, and given that the Hydrology budget does not cover hardware (or sustaining support thereof). OS&T has imposed a requirement that CHPS must function within the same performance envelope as NWSRFS. OSIP project 07-059 (“RFC

AWIPS Configuration”) will identify computing needs for RFCs based on NWSRFS, but not for CHPS.

1st Quarter FY09

- Completion of necessary tools by Deltares to allow CAT RFCs to begin migration slipped by one month, pushing the milestone from Q1 FY09 to Q2 FY09.
- A national CHPS workshop was pushed out by the CAT, to the Summer of 2009 (estimate Q4 FY09).
- Syllabus for HEC-RAS training, scheduled for 2Q FY09, has been changed to provide all RFCs with basic (steady flow) instruction. CAT RFCs require advanced (unsteady flow) training – OHD HSMB agreed to provide this training itself (dates to be determined).

2nd Quarter FY09

- Some technical problems with FEWS-RAS adapter arose during this quarter, but they are expected to be resolved during Q3
- A concern regarding ownership and maintenance of the HEC-FEWS software adapters (for HEC-RAS and for HEC ResSim access to FEWS) was addressed during this Quarter. OHD will meet with HEC on April 1 in Sacramento, CA. This issue meant that software maintenance training by Deltares for HEC has been deferred until early Summer; which also resulted in a necessary extension to the contract and a new deliverable date of Q3. This is still in time for BOC, but it increases the risk to the project, as the CAT RFCs must wait longer to test CHPS/HEC-RAS.

Dissemination (Web Pages)

AHPS Web Page Activities

Core Goal: Generate and disseminate information to and for our users

Management Lead: Donna Page

Objective: Provide a standard look and feel for the presentation of AHPS hydrologic and forecast information on the World Wide Web by all NWS weather offices. Also, complete the implementation of a single national database that aggregates information on hydrologic observation and service locations used by WFOs and RFCs (National Rivers Location Data Base - NRLDB).

Milestones

Task	Due Date	Status
1. Phase VI development and testing	FY08 Q3	In progress
2. Phase VI deployment	FY08 Q4?	Depends on web consolidation
3. Phase VII definition	FY08 Q3	Delayed to FY08 Q3
4. Phase VII development	FY09 Q1	Not started

Accomplishments/Actions

1st Quarter FY07

- Delivered and supported implementation of core Phase IV deliverables on regional web-farms
- Modified AHPS CMS to resolve potential river database loops. Solution will be implemented with Phase V
- Developed inundation prototype for OCWWS/OHD

2nd Quarter FY07

- Finalized inundation prototype look and functionality
- Deployed inundation prototype for NOAA/NWS review
- Integrated AJAX into national precipitation development pages and AHPS HSA pages
- Developed KMZ output for river observation and forecast data

3rd Quarter FY07

- Delivered Phase V to Regions for review
- Implemented first flood inundation site in NC
- Phase VI development underway

4th Quarter FY07

- Several new inundation web interface features added to code set
- Implemented 16 additional inundation locations in NC
- AHPS CMS modified to fully manage inundation configuration options
- NRLDB version 2.0 delivered to OCWWS for review/testing
- Phase VI development continues

1st Quarter FY08

- Provided 5 Texas inundation locations for review by Government on AHPS staging server.
- Worked on new inundation water-depth process to merge Triangulated Irregular Network (TIN) and Digital Elevation Model (DEM) datasets for Texas and North Carolina locations.
- Finished beta version of new hydrograph generation software for future consolidated web-farms. Waiting to test on AHPS backend blade servers.

- Started documenting NRLDB tables to move to AHPS-CMS database for web operations.

2nd Quarter FY08

- Started processing new inundation data for 10 Texas and 1 North Carolina location.
- Worked with OCWWS and South Region Headquarters on QC processes for 5 Texas inundation locations.
- Finished work on two new inundation water-depth processes.
- Worked on documenting NRLDB to move to AHPS-CMS database for web operations.
- Started working with AHPS blade server on NWS HQ web-farm

3rd Quarter FY08

- Implemented four inundation locations in Texas.
- Provided nine new inundation locations for review by OCWWS and Southern Region Headquarters
- Started work on inundation zoom feature overlap which was requested by OCWWS
- Implemented development CMS database at HQ web-farm
- Started processing NWS HML products to create hydrographs on HQ AHPS blade servers

4th Quarter FY08

- Implemented nine inundation locations along the Gulf Coast
- Based on discussions with and algorithm approval by OCWWS and NOAA Coastal Services, modified the inundation water depth shapefile TIN/DEM merge process to improve on shallow water depth estimates.
- Updated beta version Web-HydroGen code to fix known issues.
- Worked with OCWWS to reestablish NRLDB version 2 process and deployment testing

1st Quarter FY09

- Worked with OCWWS HSD to test NRLDB version 2 and made code changes at their request
- Delivered four LCRA inundation sites for review by WGRFC
- Worked on development and implementation of new database driven HIC web site
- Worked with Web CCB to implement/test AHPS Phase VI checklist dependencies

2nd Quarter FY09

- Worked with OCWWS HSD to test NRLDB version 2 and made code changes at their request
- NRLDB version 2 now deployed at all WFOs
- Updated inundation data for LCRA inundation sites per request by WGRFC
- Implemented new database driven HIC web interface
- Worked on implementation AHPS Phase VI checklist

Problems Encountered/Issues

1st Quarter FY07

- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- Found issue where WFO users could create a river database loop in the AHPS CMS
- Continued to have intermittent SQL update issues with the cluster database at CRH. Will establish a development cluster database to determine a long-term solution

2nd Quarter FY07

- Continued to have occasional issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue. Additionally OCIO implemented a new database population process, which did not meet hydrologic text product requirements. OHD worked with OCIO developer to resolve issues.

3rd Quarter FY07

- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- Unable to obtain required web consolidation documentation from OCIO for AHPS Phase VI development architecture planning

4th Quarter FY07

- Delays in web consolidation data/file synchronization adversely affect AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affect AHPS Phase VI development architecture planning
- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue

1st Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning
- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- New text product issue caused missing NWS products for all AHPS pages. NWS OCIO is aware of issue and has indicated that they will address their PHP code.

2nd Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning
- Continued to have issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue

3rd Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

4th Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

1st Quarter FY09

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

2nd Quarter FY09 - None

Western Water Supply Forecast Service Improvement

Core Goal: Dissemination

Management Lead: Kevin Werner

Objective: Improve western water supply forecast services by incorporating all NWS water supply forecasts, ensemble forecasts, forecast verification, and data access into web services.

Milestones

Task	Due Date	Status
1. Launch enhanced web site for water supply and water resources outlooks	Q1	Complete
2. Develop goals for CY09 developments	Q3	-
3. Develop new capabilities based on goals in (2)	Q4 / FY10Q1	-
4. Conduct outreach activities at water management meetings	Q4	Ongoing
5. Pass OSIP gate 2	Q4	-

2nd Quarter FY08

- Outreach Activities (travel funded by this AHPS project):
 - Verification Workshop: In partnership with the Western Water Assessment RISA and the NRCS, NWS organized a verification workshop targeted at water managers in Colorado. The workshop was held in February 2008 and was very well attended. About 70 attendees participated in the day long workshop which featured a hands on lab exercise with the web site.
 - Climate Prediction Applications Workshop – The project was presented at the annual CPASW workshop in Chapel Hill, NC in March 2008.
 - Drought Monitor Workshop – The project was presented at the annual Drought Monitor Workshop in Portland, OR in October 2007.
- Planning Meeting: Planning meeting is scheduled for May 2008 in Boulder, CO. An agenda is available upon request.
- Hardware Support: NWRFC is current scoping hardware to support the project.
- Contract Support: NWRFC contractor is currently supporting project through WR FY07 funding. Expect to establish a contract under this project during Q3.

3rd Quarter FY08

- Outreach Activities (travel funded by this AHPS project):
 - Western Snow Conference – Project presented at annual western snow conference in Hood River, OR on 4/16
 - USBR/USACE/USBR Pacific Northwest Meeting in Portland, OR on 5/6
 - Montana Hydrology Meeting in Great Falls, MT on 5/27
- Planning Meeting: Planning meeting was held in Boulder, CO with NOAA ESRL scientists, western water assessment, and USBR personnel. Major outcomes include the following enhancements planned for a fall 2008 release:
 - Enhanced map interface for ESP forecasts and observed streamflow
 - Improved look and feel for web presence
 - Capabilities for non water supply forecast points from any RFCs
 - Climate change sensitivity studies
- Hardware Support: Hardware is on order through Dell to support project
- Contract Support: NWRFC contractor (Heydt) under contract to maintain a portion of the existing code
- OSIP Status: Documentation has been submitted for OSIP gate 1. OCWWS (Mullusky) is

working on gate 2 documentation.

- Budget: Expenditures to date:
 - Travel (outreach + planning meeting) = \$10,023.08
 - Hardware = \$20347.90
 - Contract support = \$8,000 (\$4k for training government employees; \$4k for contractor)
 - Total spent to date: \$38,370.98

4th Quarter FY08

- Development on forecast verification and water resources outlook continued
- Monthly calls held
- Major web application slated for 1st Quarter FY09
- Plans laid to bring in other RFCs for water resources outlook leveraging ESP at each office.
- Travel funded from this AHPS project:
 - Paul McKee (WGRFC) visit to CBRFC for training
 - Kevin Werner visit to Tucson for meeting with CLIMAS
- Additional computer hardware purchased for NWRFC web server and CBRFC development
- Linux training provided to 2 CBRFC employees

1st Quarter FY09

- Project passed OSIP gate 1 and OSIP IWT formed for gate 2
- Web site reviewed by participating RFCs
- Ongoing development addressed review comments and suggestions
- Briefing conducted for all RFCs, regions, and NWSH personnel on status and potential for a nation wide water resources outlook in Nov 2008
- All RFCs except APRFC named a focal point to work with on including their AHPS points in the national water resources outlook
- CBRFC conducted verification studies using verification tool
- Project presented at fall AGU meeting (Dec), WCM/SCH course (Dec), RFC verification workshop (Nov), Nevada's Colorado River Commission (Dec), and the October NIDIS planning meeting (Oct)
- Planning meeting for FY09 early FY10 developments tentatively slated for late 2nd quarter FY09 depending on FY09 AHPS funding. Meeting would include subset of RFCs. Major new development opportunities include:
 - Expansion of water resources outlook capabilities (e.g. further leveraging existing AHPS products for low flow probabilities)
 - Refinement of database
 - Refinement of climate change capabilities
 - Development of water resources outlook verification
- Continuing to add additional RFCs into water resources outlook as their forecasts and data become available

2nd Quarter FY09

- Launched new version of NWS water supply / water resources outlook website in January 2009
- Integrated ESP forecasts into water resources outlook from the following RFCs: NW, CN, CB, MB, AB, WG, OH, MA, and NE.
- Partially completed ESP integration from SE and LM RFCs
- Project presented at COMET climate variability course (Mar), Climate Predication and Applications Workshop (Mar), and Border Governors Conference (Mar)
- Management briefings held for WRH (Feb) and OHD and OCWWS/HSC (Apr 1)
- Planning meeting for FY09/FY10 developments delayed to 3rd quarter because of budget uncertainty. Targeting early June for planning meeting in Salt Lake to include principles. See 1st quarter report for meeting goals.
- Teleconference for RFCs held in early April to discuss status and future directions
- IWT for OSIP gate 2 work being formed.

Problems Encountered/Issues

2nd Quarter FY08 – None

3rd Quarter FY08 - None

4th Quarter FY08

- NWRFC contractor was awarded substantially smaller contract than originally planned. Federal employees conducted much of the development originally slated for the NWRFC contractor. Therefore some of the budget was applied toward training for federal employees instead of outside contractor.

1st Quarter FY09

- Web site deployment delayed until early 2nd quarter FY09 due to conflicting schedules and unforeseen difficulties addressing key comments
- No APRFC focal point named for water resources outlook

2nd Quarter FY09

- Planning meeting delayed to late 3rd quarter due to budget uncertainties
- 2nd quarter travel activities financed on “credit” since budget was not available.

New Service Locations

AHPS Implementation APRFC

Management Lead: Ben Balk, APRFC

Objective: Implement probabilistic hydrologic forecasts for basins in the Alaska/Pacific Forecast Center's (APRFC) area of responsibility.

Milestones

Task	Forecast Points Planned	Due Date	Actual to Date 2 nd Qtr FY09	Variance
Identify 15 potential basins for new calibrations		1 st Qtr	Complete	
Calibrate 15 new basins for non-AHPS implementation	15	4 th Qtr	7	8
Implement 15 new forecast points (non-AHPS)	15	4 th Qtr	0	15
Identify 12 locations for AHPS implementation for FY08		1 st Qtr	Complete	
Recalibrate and prepare historical time series for 12 existing non-AHPS basins to utilize new data sources and improve forecast performance	12	4 th Qtr	11	1
Implement 12 new AHPS points	12	4 th Qtr	2	10
Total	12		2	10

Accomplishments/Actions

1st Quarter FY09

- Identified 12 new AHPS points that will be implemented this fiscal year.
- Performed recalibrations and extended historical times series for 11 of these basins.
- Identified 15 new basins to calibrate. Began data collection and analysis.
- Identified additional previously calibrated basins (non-AHPS points) that have not performed well. Began calibration process to add new data sources and improve model parameters.

2nd Quarter FY09

- Completed calibration of 7 new basins, but have not implemented new forecast points.
- Completed data collection for an additional 3 basins, but have not started calibrations.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09

- Reduced staffing during March and April

AHPS Implementation for NCRFC

Management Lead: Scott Dummer, HIC/NCRFC

Objective: Implement probabilistic hydrologic forecasts for basins in the North Central River Forecast Center's (NCRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 2 nd Qtr FY09	Variance
Fox River			2 nd Qtr	+1
Des Moines River			2 nd Qtr	+1
Cedar River			2 nd Qtr	+1
Total	0		0	+3

Note: NCRFC has implemented all the probabilistic points we can within our area of responsibility. We are now reliant on getting further probabilistic information from MBRFC.

Accomplishments/Actions

1st Quarter FY09

- N/A

2nd Quarter FY09

- Added three forecast points
 - Fox River – Montgomery, IL
 - Des Moines River – Eddyville, IA
 - Cedar River – Waverly, IA

Problems Encountered/Issues

1st Quarter FY09

- N/A

2nd Quarter FY09 - None

AHPS Implementation for MBRFC

Management Lead: Steve Predmore, HIC

Objective: Implement probabilistic forecasts for basins in the Missouri Basin River Forecast Center's (MBRFC) area of responsibility. For FY09 this includes the South Platte Basin below Kersey, CO, the Upper Smoky basin in Kansas, portions of the Platte River basin in Nebraska, Tongue River and Powder River portions of the Yellowstone basin in Wyoming and Montana, water supply locations in the Upper Missouri River basin, and reservoirs in the Niobrara River basin in Nebraska.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (2nd Qtr FY09)	Variance
South Platte Basin below Kersey, CO	6	2 nd Qtr	6	0
Portions of Platte River basin in Nebraska	9	4 th Qtr	0	0
Portions of Yellowstone basin in WY and MT	6	4 th Qtr	0	0
Water Supply Points in the Upper Missouri River Basin in MT	8	4 th Qtr	0	0
Upper Smoky Basin in KS	11	4 th Qtr	0	0
Niobrara Reservoirs in NE	2	1 st Qtr	2	0
Total	42		8	0

Accomplishments/Actions

1st Quarter FY09

- Added two reservoirs
 - Box Butte Res NE
 - Merrit Res NE

2nd Quarter FY09

- Added six forecast point for the South Platte Basin below Kersey, CO

Problems Encountered/Issues

1st Quarter FY09 - none

2nd Quarter FY09 - none

AHPS Implementation for MARFC

Management Lead: Peter Ahnert (HIC/MARFC), Joe Ostrowski (DOH)

Objective: Implement probabilistic hydrologic forecasts for basins in the Middle Atlantic River Forecast Center's (MARFC) area of responsibility. MARFC implemented basic AHPS for existing forecast points in the entire MARFC area of responsibility in FY 2006.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 st Qtr FY09)	Variance
Total	0			

Accomplishments/Actions

1st Quarter FY09

- MARFC has completed basic AHPS implementation for its entire service area.
- AHPS Outreach:
 - MARFC's SCH gave a presentation on AHPS products and services at the annual meeting of the New Jersey Association of Floodplain Managers in Cherry Hill, NJ.
 - MARFC's SCH gave a presentation on MPE to coastal services staff of the Maryland Dept of the Environment, Baltimore, MD. The data will likely be used to help decision-makers that regulate access to public bathing beaches.
 - MARFC's HIC and SCH staffed a MARFC exhibit booth with AHPS education materials at the office dedication-open house for WFO Sterling, VA. In addition to the general public, attendees included congressional representatives and NOAA leadership.
 - MARFC continues participation in the ER Outreach Display Replacement team to ensure the inclusion of AHPS.
- Hydrologic Modeling:
 - MARFC has contracted Riverside Technology Inc. (RTi) to calibrate the Sacramento SMA rainfall-runoff model, the SNOW_17 model, and unit hydrographs for 5 headwater basins in the Susquehanna drainage. This was supported by the Susquehanna River Flood forecast and Warning Initiative.
 - MARFC met with RTi and received an update on their work to calibrate the Sacramento SMA rainfall-runoff model, the SNOW_17 model, and unit hydrographs for 5 headwater basins in the Susquehanna drainage. RTi also provided MARFC with training on the Sacramento Model.
 - Calibration was completed on 2 of the 4 basins for the 1-hour lumped API-Continuous model. (1st step in distributed modeling).
- Multisensor Precipitation Estimator
 - MARFC Expanded MPE operational implementation to 100% of their forecast area.
 - MARFC completed development of hourly and daily maps that show the difference between MPE and QPF for the same time period. These are useful tools for river forecast operations.
- National Verification Team:

- MARFC continued to participate in the National Verification Team.
- MARFC is using the Ensemble Verification System to analyze two years of precipitation estimates for the Juniata basin.
- MARFC attended the National Verification Workshop in Salt Lake City, UT. They completed work on a case study to learn and evaluate the new software.
- GIS Map Enhancement:
 - A Penn State Univ student volunteer at MARFC completed her project to use GIS to add topography to the RFC basin maps. The maps will be used by MARFC hydrologists in daily river forecast operations.
- CoCoRaHS:
 - 543 stations are now in use, with an additional 151 evaluated and deemed unreliable for implementation.
- Training
 - MARFC staff participated in a GoTo meeting training sessions on:
 - Recent Research on calibrating the Sacramento Model.
 - Recent work in short range quantitative precipitation forecasting and its application in hydrologic prediction in the Czech Republic.
 - OHD visited MARFC and provided briefings on River-Estuary-Ocean modeling and Distributed Hydrologic Modeling.
 - MARFC participated in the NWSCHAT for RFCs webinar to learn more about its potential use for communicating with MARFC partners.
 - MARFC staff participated in the following webinars: 2-D Modeling of River Estuary and Ocean Interactions. Western Region Water Resource Outlook
- Ensemble River Forecasts:
 - MARFC worked to improve the reliability of the SREF data feed by moving from the development system to the more production-oriented NCEP files which are supported 24x7.
 - OHRFC and NERFC are now implementing the system developed at MARFC.
 - MARFC is working to incorporate a second 64-bit box, to create a 2 machine cluster for redundancy, and, a network file server, so we can archive the grib files.
- Water Resource Outlook
 - MARFC is developing a local water resource outlook.
- QPF
 - Testing and development work continues to integrate GFE into operations. A first test QPF was created for MARFC basins this month.

2nd Quarter FY09

- Hydrologic Modeling:
 - Calibration work was completed on 4 basins for the 1-hour lumped API-Continuous model. These basins are now in a test-mode for evaluation.
 - Attended meetings at College Park, MD and Falls Church, VA concerning modeling in the Chesapeake Bay watershed.
 - Worked with OHD to generate PQPF ensembles to support MARFC's cooperative project with SUNY Brookhaven.
 - MARFC began preparation for the migration to CHPS through participation in new weekly conference calls. They are also working on the Basic Operation Capability document in conjunction with the other CAT2 RFCs.
- GIS Map Enhancement:

- A Penn State Univ. student volunteer at MARFC completed her project to use GIS to add topography to the MARFC basin maps. The maps will be used by MARFC hydrologists in daily river forecasting.
- Hydrologic Verification
 - MARFC completed a case study for the NWS Hydrologic Verification Team using the Ensemble Verification System (EVS).
 - MARFC assisted contractor (RTi) by providing data and participating in meetings, for their SAC-SMA calibrations.
 - MARFC is designing local verification of flood forecasts and QPF for our staff.
- Training
 - MARFC participated in a CIPS Coastal Inundation mapping webinar
 - MARFC participated in a CHPS Introduction for RFCs webinar
 - Two senior hydrologists traveled to Colorado to receive training from Riverside Technologies, calibrating several points in the headwaters of the Susquehanna basin for the SAC-SMA model.
- Water Resource Outlook
 - MARFC completed development of a new local water resource outlook (WRO) service. The “WRO” is now under review by Eastern Region for consideration as a new experimental product.
 - National Water Resource Outlook – MARFC is working with NWS Western Region to process and automate MARFC-generated probabilistic forecasts for display on the National Water Resources Outlook webpage.
- QPF
 - MARFC completed initial set-up and configuration of GFE.
- Outreach
 - MARFC continues participation in the ER Outreach Display Replacement team to ensure the inclusion of AHPS.
 - Worked with ERH HSD to plan a generic ER briefing package to be used for FEMA conference calls. The package may be expanded for use by all ER RFCs.
 - MARFC worked with our collocated WFO CTP to staff an exhibit booth at the Pennsylvania Farm Show. AHPS material was distributed.
 - MARFC completed work on a regional team to mark the 10-year anniversary of Hurricane Floyd with inland flooding outreach and education, namely a webpage dedicated to the anniversary, <http://www.erh.noaa.gov/mhx/Floyd/index.php>
 - MARFC’s SCH gave a presentation on the use of National Weather Service Precipitation data as decision support for public health at bathing beaches – at Maryland Dept of the Environment’s Annual Beach Conference in Baltimore, Mar 26th.
 - MARFC is now providing the Virginia Dept of Health with MPE precipitation information. Virginia is collecting the daily rainfall total files for use supplementing their routine water sampling and water quality analysis work.
- Ensemble River Forecasts
 - Added snow water equivalent plots to MARFC suite of products.
 - Added Elmira, NY as a relational point.
 - Training presentation given to WFO PHI (Mt Holly)
 - Training presentation given to SERFC
 - Created wiki page to facilitate the creation of Ensemble River Forecast System documentation by 3 ER RFCs.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

AHPS Implementation for NERFC

Management Lead: David Vallee (HIC/NERFC), Robert Shedd (DOH)

Objective: Implement probabilistic hydrologic forecasts for basins in the Northeast River Forecast Center's (NERFC) area of responsibility. The NERFC goal is to have AHPS implementation for long-term forecasts for the entire NERFC area of responsibility by the end of FY 2010.

Milestones

Implementation Area	Forecast Points Planned	Due Date FY09	Actual to Date (1 st Qtr FY09)	Variance
Southern New England	3	1 st Qtr.	3 (1 st Qtr FY09)	0
Connecticut River	2	3rd Qtr.	0	0
Housatonic River	1	3rd Qtr.	0	0
Total	6	FY09	3	0

Accomplishments/Actions

1st Quarter FY09

- Three new AHPS forecast points were completed in the Southern New England forecast group: NBRM3 - Blackstone River at Northbridge, MA; WOOR1 - Blackstone River at Woonsocket, RI; YTCC3 - Yantic River at Yantic (Yantic is a carryover from FY08 implementation).
- One new river forecast point was added in the Maine forecast group: AUBM1 - Androscoggin River at Auburn, ME. This location is not currently generating ensemble products because there is a portion of the area not currently being modeled. The addition of a new AHPS forecast is on hold until this gets worked out in the near future.
- Two members of the NERFC staff met with the Distributed Modeling group at OHD to discuss procedures for implementing RDHM at NERFC. NERFC would like to have a few test basins available this year.
NERFC is working with RTi on the FY08 funded calibration project. They also received significant support from RTi on how to improve the implementation of the results from their previous task on the Connecticut River.
NERFC met with several representatives from the USGS Connecticut and gave presentations providing an overview of NERFC operations including AHPS and CHPS implementation activities.
NERFC had a joint conference call with RTi and USGS regarding calibration locations on Onondaga Lake in New York. These are potential locations for FY09 calibration in the Oswego River Basin of New York State. It appears that a successful calibration will not be possible at this point due to a lack of sufficient data and the likely requirement to model hydraulically. RTi is continuing to investigate.

2nd Quarter FY09

- RTi is continuing work on the FY08 calibration project. They have found sufficient correlations with nearby gages to adequately calibrate locations in the Finger Lakes Basin at higher flow levels. They are planning on finishing their work in June, and NERFC staff will be traveling to Ft. Collins in May.
- Major activity this month has focused on the start of CHPS migration activities. Two staff members attended the migration workshop in KC. The following week, NERFC had a visit from

Deltares staff to help install the work they have done. NERFC has approximately 15 locations now that they can run. This will move into high gear over the next couple of months.

- NERFC is getting close to implementing locations in the Connecticut River Basin. Several points in the Connecticut basin have been installed in NWSRFS, but AHPS plots are not yet being generated.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 - None

AHPS Implementation for OHRFC

Management Lead: Craig Hunter (HIC/OHRFC), Tom Adams (DOH)

Objective Implement probabilistic hydrologic forecasts for basins in the Ohio River Forecast Center's (OHRFC) area of responsibility. The OHRFC implemented basic AHPS for all existing long-term forecast points in the OHRFC area of responsibility in FY 2006.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 st Qtr FY09)	Variance
Total	0			

Accomplishments/Actions

1st Quarter FY09

- OHRFC has completed basic AHPS implementation for its entire service area.
- Re-calibration of the Allegheny R basin has begun, including re-analysis of the MAT & MAP time series. Re-calibration of the Great Lakes (Lake Erie) drainage basins using one hour time steps is continuing.
- Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio R. & Great Lakes Div. of the USACE and the USGS; progress has been achieved in downstream reaches of the Ohio in the OHS forecast group.
- Implementation of the ARW version of the WRF model on the OHRFC Linux cluster is completed. Additionally, the OHRFC is working cooperatively with the NERFC, MARFC, and NCEP to implement a GFS ensemble and SREF-based approach to short lead-time probabilistic hydrologic forecasting; routine 00Z & 12Z GEFS and 03Z, 09Z, 15Z, & 21Z SREF model runs have been achieved. OHRFC has completed implementation of MARFC's MMEFS system (a modification of NERFC's GENS system), which greatly accelerates processing on a non-AWIPS 64-bit Linux machine.

2nd Quarter FY09

- Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio R. & Great Lakes Div. of the USACE and the USGS. Significant progress has been achieved in downstream reaches of the Ohio River.
- The OHRFC continues to work in cooperation with the NERFC, MARFC, and NCEP to implement a GFS ensemble and SREF-based approach to short lead-time probabilistic hydrologic forecasting. Routine 00Z & 12Z GEFS and 02Z, 09Z, 15Z, & 21Z SREF model runs have been achieved. Implementation of MARFC's MMEFS system (a modification of NERFC's GENS system) is complete.
- OHRFC has developed a new continuous water watch product for droughts and floods called the Water Resources Outlook (WRO) for the Ohio Valley, utilizing the National Weather Service's Hydrologic Ensemble Streamflow Prediction (ESP) system. This is a new way of viewing long range probabilistic forecasts that users can easily understand.

There has been a growing demand by customers for a continuous water watch beyond the currently issued spring flood outlooks. The OHRFC's Water Resources Outlook assists WFO's by filling a gap in RFC services, by providing a continuous water watch for floods and droughts beyond what is presently available. The WRO links USGS flows to NWS forecasts of much below, below, normal, above, and much above normal streamflows.

This is done for the 30, 60 and 90-day periods. Products can be seen at <http://www.weather.gov/ohrfc/WRO.shtml>. The WRO is available for basins as well as AHPS forecast points. Results for a two-year period show 80% of the basins were forecast in the correct category. The probability of detection (POD) for above average streamflows was 74% with a false alarm rate (FAR) of 17%. The POD for below average streamflows was 64%, with a FAR of 9%.

With extensive positive user feedback from groups including CPC, USGS, Universities, CORPS, Ohio River Valley water sanitation commissions and others, Eastern Region moved the WRO from experimental to operational status.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 - None

AHPS Implementation for ABRFC

Management Lead: Billy Olsen, HIC

Objective: Implement probabilistic forecasts for basins in the Arkansas-Red Basin River Forecast Center's (ABRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 2 nd Qtr FY09	Variance
Lower Neosho River in Kansas	1	1 ST Q	1	0
Total	1		1	0

Accomplishments/Actions

1st Quarter FY09

- One new forecast point to report as implemented this quarter. This is a carryover not previously counted from FY-08 implementation on 31 August 2008.
- ABRFC continues to test and implement RES-J calibrations from prior year contract work.
- ABRFC issued all operational AHPS products for the quarter.
- The in-house recalibration of the WKANSAS, HAVARK and VERD forecast groups is complete.
- The script created by James Paul to complete the rsync process on Idad was corrected and worked fine for December.
- The COLRADO forecast group was redefined to include known diversion data operationally and in ESP mode. AHPS calibration has been checked against the historical diversion data.
- Recalibration work is underway on the LWRNEO forecast group.

2nd Quarter FY09

- ABRFC continues to test and implement RES-J calibrations from prior year contract work.
- ABRFC issued all operational AHPS products for the quarter.
- The in-house recalibration of the LWRNEO, EUFINF and WASHITA forecast groups is complete.

Problems Encountered/Issues

1st Quarter FY09 –

- The November monthly issuance of ESP graphics was not completed until 12/02/2008 due to an sync problem.

2nd Quarter FY09

- None

AHPS Implementation for LMRFC

Management Lead: Dave Reed, HIC

Objective: Implement probabilistic hydrologic forecasts for basins in the Lower Mississippi River Forecast Center's (LMRFC) area of responsibility. For FY09 this includes the Pascagoula, Gulf Drainages, Amite/Comite, St. Francis and Black River basins

Milestones:

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 st Qtr FY09	Variance
FY08 Carryover	5	Q1	5	0
Pascagoula Basin, MS	2	Q1	2	0
Mississippi Gulf Drainage Basin, MS	4	Q1	4	0
Amite/Comite Basin, LA	7	Q2	2	5
Amite/Comite Basin, LA	7	Q3	0	0
St. Francis, AR/MO	7	Q4	0	0
Black, MO	2	Q4	0	0
Total	34		13	5

Accomplishments/Actions

1st Quarter FY09

- FY09 draft SOO completed and awaiting ARC notification on AHPS allocations so LMRFC can begin FY09 market research activities. Also awaiting FY09 Task # assignment by NWS COTR.
- November 3, received all preliminary FY08 calibration decks from RTi for LMRFC review.
- November 21, received 5 revised FY08 calibration decks from RTi for LMRFC review.
- December 12, coordination call held with RTi on FY08 calibration progress and activities. LMRFC awaiting delivery of draft Final report.
- Implemented 6 new AHPS sites for WFO LIX in the Pascagoula (2) and Mississippi Gulf Drainages Basins (4): PGFM6, ORAM6, GLFM6, LYMM6, DIBM6, and KLM6.
- Provided a brief overview of AHPS activities for the USACE, USGS, and TVA during our annual meetings with these Agencies.
- Completed 2 additional historical MAPs, one each for the St. Francis and Black River in Missouri. Reworked historical MAPs for the Pascagoula, Amite/Comite, St. Francis, and Black basins. Currently developing historical MAPs for the Calcasieu basin, with a total of 11 MAPs.
- Four in-house basin calibrations were completed this Quarter:
 - Pascagoula Basin: VESM6, REDM6, AND WILA1
 - Mississippi Gulf Drainage Basin: BLWM6
- AHPS outreach activities:
 - October 14-16, poster presentation on NWS flood inundation mapping at the NWA Conference held in Louisville.
 - October 28-29, presentation on Storm-Surge Modeling in the Pascagoula Basin at the Bays and Bayou Symposium held in Mobile.

- November 6, in-house visit from LSUHSC Emergency Preparedness Specialist Dr. Alfred Trappey.
- November 12 – 13, presentation on Storm Surge Modeling at the Gulf Coast Hurricane Center (PIANC) held in Mobile.
- November 13, participated in NOAA Sea Grant outreach event at LSU and distributed over 1,000 AHPS brochures in Baton Rouge, LA.
- November 17, Mississippi Civil Defense EMA Meeting in Natchez, MS.
- November 18 - 19, briefed USGS, USACOE, and other NWS offices on LMRFC AHPS activities at the Annual Tri-Agency meeting in New Orleans, LA.
- LMRFC continues support of AHPS activities with in-house calibration effort for remaining basins east of the Mississippi River.

2nd Quarter FY09

- FY08 contract activities near completion. RTi has completed FY08 contractual activities and the T8-0007 Final Report has been approved by HIC.
- Awaiting ARC notification on AHPS allocations so LMRFC can begin FY09 market research activities and awaiting FY09 Task# assignment by NWS COTR. Submitted supporting documentation for FY09 market research.
- Implemented 2 new AHPS sites (DARL1 and OLV1) and prepared ESP segment definitions to implement CMTL1, DENL1, BYML1, PVLL1, and LPOL1.
- AHPS outreach activities this month.
 - Jan. 7, in-house visit from HPC Meteorologist Jack Bevin
 - Jan. 20 – 21, participated in Coastal Resiliency Conference, Baton Rouge, LA.
 - Jan. 28, in-house visit from representatives of the Hawaii and Louisiana NOAA Sea Grant offices
 - Feb. 3-4, MEG Hazards Workshop, Memphis, TN
 - Feb. 3-4, USCACE Navigation Workshop, WES, Vicksburg, MS
 - Feb. 19, Meet with St. Tammany Parish Engineer
 - Feb. 27, Gulf Coast Marine Workshop, Lafayette, LA
 - March 2-3, distributed AHPS materials at DOE conference, New Orleans, LA
 - March 3-5, Inland Waterways Navigational Conference held in Nashville, TN
 - March 10, in-house visit from NGI/NOS's Julien Lartigue
 - March 17-18, attended Unstructured Grid Workshop, Bay St. Louis, MS
 - March 25, attended NOAA Tide and Datum Training, Baton Rouge, LA
 - March 26, in-house visit from SRH's Jack Settelmaier
- Completed one in-house basin calibration (SHBM6).
- Prepared and hosted OHD Calibration Workshop at LMRFC, March 9 – 13, 2009.
- LMRFC contacted state floodplain managers in AR, TX and TN to locate potential sites with required hydraulic and terrain data to set up for AHPS static inundation maps. Also coordinated with OHD and WFOs GSP and HUN on potential static inundation mapping sites. So far TKS7, BIRN7, BLTN7 and CTPN7 have been approved for mapping.
- LMRFC continues support of AHPS activities with in-house calibrations for remaining basins east of the Mississippi River.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09

- NWSRFS software issues impact the ability to prepare AHPS probabilistic forecasts for additional forecast sites. OCWWS/HSB/RFC support group believes this is due to array size issues in the NWSRFS FORTRAN code in ESP and LMRFC cannot prepare 90-day probability graphs to support AHPS implementation for Amite/Comite River in LA. Trouble ticket #354848 was opened on 2/17/09 by Lavonne Tongue and DR 20750 was created by Xiaobiao Fan.

AHPS Implementation for SERFC

Management Lead: John Feldt, HIC

Objective Implement probabilistic hydrologic forecasts for basins in the Southeast River Forecast Center's (SERFC) area of responsibility. For FY09 this would complete AHPS sites in portions of Georgia, Alabama, and north Florida.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1st Qtr FY09)	Variance
Choctowahatchee and Apalachicola	2	1 st Qtr	2	0
	4	1st Qtr	4	
Alabama	9	2nd Qtr	8	-1
Suwannee	6	3 rd Qtr		
	5	4 th Qtr		
Total	26	FY08	6	0

Accomplishments/Actions

1st Quarter FY09

- There has been a request to southern region to replace Maximum exceedance graphs with Mean exceedance graphs. It is believed that these will be more informative to the public and agencies using these products. The outcome of that request is still pending. This has been nixed by both Southern and Eastern regions....the matter is closed.

2nd Quarter FY09 - None

Problems Encountered/Issues

1st Quarter FY09 –None

2nd Quarter FY09 - None

AHPS Implementation for WGRFC

Management Lead: Thomas Donaldson, WGRFC

Objective: Implementation of probabilistic hydrologic forecasts for the Colorado basin in the West Gulf River Forecast Center's area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 st Qtr FY09	Variance
Total	54			

Accomplishments/Actions

1st Quarter FY09

- Assimilated observed streamflow, MAPX, fs5files, and ESRI basin definition shape files datasets and provided to RTi in support of their headwater calibration work scheduled for the Colorado River system under the 2008 AHPS contract:
- Sub-divided basins at LCRA streamgage locations, and delineated new basin boundaries using IHABBS.
- Computed 1 and 6 hour MAPX for Colorado River basins.
- Began effort to compute historical MAPs for use in ESP
- Developed FY 2009 AHPS outreach plan.
- Coordinated with Brazos River Authority on the production of non-baseline AHPS products. Developed procedures to create and disseminate the following products:
 - 30 and 90 Day Flow Exceedance Table
 - 30 Day Weekly Histogram
 - 30 Day Exceedance Plot
- Coordinated FY 2009 implementation points in the Colorado River Basin with all effected WFO's (MAF, SJT, EWX, HGX)
- Began assimilation of reservoir elevation, inflow, and outflow timeseries for Colorado River Reservoir projects to support reservoir modeling.
- Split the Colorado Forecast Group (COLO) into an upper and lower forecast groups (UCOL & LCOL)
- Wrote scripts to semi-automate the process of adding ESP to segment definitions.
- Added ESP to the Colorado Basin segments.
- Coordinated with Brazos River Authority on the production of additional non-baseline AHPS products.
- Provided Donna Page with spreadsheet of proposed work for the Guadalupe and San Antonio River systems in FY 2010. Also provided proposal for additional work required to develop a snow model for the Upper Rio Grande and Pecos basins.

- Created prototype non-baseline probabilistic text products on selected Trinity River forecast points for the Tarrant Regional Water District.

2nd Quarter FY09

- Reviewed the water balance analysis performed by RTi. Provided comments and reviewed updated water balance.
- Collected historical reservoir data from LCRA. Quality controlled the dataset and reformatted into OH Datacard format.
- Performed market research with RTi for potential hydrologic modeling in upper Rio Grande basin.
- Analyzed available data on the Guadalupe and San Antonio rivers in preparation for market research for FY10 contract.
- Completed MAP development for Colorado, Guadalupe, and San Antonio River Basins.
- Compiled LCRA diversion data for lower Colorado and provided to RTi.
- Continued RES-J model development for LCRA and Corps of Engineers reservoirs in Colorado River Basin.
- Compiled station inventory for San Jacinto River system.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 – None

AHPS Implementation for CBRFC

Management Lead: Michelle Schmidt, HIC/CBRFC

Objective: Implement probabilistic hydrologic forecasts in the Colorado Basin River Forecast Center's (CBRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 st Qtr FY09	Variance
Total	0		0	0

Accomplishments/Actions

1st Quarter FY09

- N/A

2nd Quarter FY09

- N/A

Problems Encountered/Issues

1st Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

AHPS Implementation CNRFC

Management Lead: Robert Hartman, HIC/CNRFC

Objective: Implement probabilistic hydrologic forecasts in the California-Nevada River Forecast Center's (CNRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 st Qtr FY09	Variance
Total	0		0	0

Accomplishments/Actions

1st Quarter FY09

- N/A

2nd Quarter FY09

- N/A

Problems Encountered/Issues

1st Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

AHPS Implementation for NWRFC

Management Lead: Harold Opitz, HIC/NWRFC

Objective: Implement probabilistic forecasts for basins in the Northwest River Forecast Center's (NWRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 st Qtr FY09	Variance
Total	0		0	0

Accomplishments/Actions

1st Quarter FY09

- N/A

2nd Quarter FY09

- N/A

Problems Encountered/Issues

1st Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

Training

Hydrologic Science Training - COMET

Theme: Training

Management Lead: Jeff Zimmerman

Objective: Develop training and education materials to facilitate the implementation of new science and technologies into hydrologic operations.

Milestones

Task	Due Date	Status
Estimation of Observed Precipitation Distance Learning Module	To be published 3 rd Q FY 2009	
Vertical Datums Distance Learning Module	To be published 2 nd /3 rd Q FY 2009	
Theory of Hydrologic Ensemble Prediction Distance Learning Module	To be published 2 nd /3 rd Q FY 2009	
Quantitative Precipitation Forecasting Virtual Course	Virtual course to be delivered June 2009	
Techniques in Hydrologic Forecast Verification Distance Learning Module	To be published 4 th Q FY 2009	
QPF Verification I Distance Learning Module	To be published 4 th Q FY 2009/1 st Q FY 2010	
QPF Verification II Distance Learning Module	To be published 1 st /2 nd Q FY 2010	
Distributed Modeling for Flow Forecast Distance Learning Module	To be published 4 th Q FY 2009	

Accomplishments/Actions

1st Quarter FY09

- Discussions were held with NWS Subject Matter Experts (SMEs) regarding the Precipitation Estimates module. Collaborated with WDTB and NESDIS to determine how we can use each other's material for training in precipitation estimates from radar and satellite. Script revision and graphics development continues.
- Conferred with Dr. Dennis Johnson regarding the next Distributed Modeling module and developed a schedule of deliverables. A contract agreement was made with Dennis who will serve as the Principal Science Advisor for the module.
- Testing of virtual class breakout sessions was conducted. Other testing will be conducted as we prepare for the QPF Virtual Class in June.
- Background research and script development continues on the Theory of Hydrologic Ensemble Prediction module.

2nd Quarter FY09 – N/A

Problems Encountered/Issues

1st Quarter FY09 None

2nd Quarter FY09 – N/A

Outreach

FY09 Hydrology Program Outreach Work Plan

Core Goal: Inform customers of our information and services, assess their satisfaction, and incorporate comments and feedback into Hydrology Program planning

Management Lead: Tom Graziano, Larry Wenzel, Regional Hydrologic Services Program Representatives

Objectives: Accomplish outreach with national, regional, and local partners and customers with emphasis on locations where AHPS or water resource services are being or will soon be implemented. Develop clear and consistent outreach materials for use by national, regional, and local personnel.

Milestones

Tasks	Org	Cost (\$1000)	Due Date	Status
National Safety Council (Includes carry-over from Oct 2008 in Anaheim)	OCWWS	5.5	Q1	Completed
Tri-Agency Conference (New Orleans)	OCWWS	1.0	Q1	Completed
Road Erosion Video (Purchase 1 for each WFO, RFC, Region and NWSHQ)	OCWWS	1.0	Q1	Completed
Purchase/distribute 45 TADD Yellow Warning Signs in support of Hurricane Floyd 10 Year Anniversary	OCWWS	2.5	Q2	Completed
Key Chains (Yellow Warning)	OCWWS	2.0	Q2	In Progress
Purchase/Distribute 100 TADD Warning Signs	OCWWS	6.0	Q2	In Progress
Reprint The Weather Channel Cyclone: Second Wave DVD	OCWWS	2.5	Q2	Completed
FEMA National Flood Conference (Boston, MA, April 2009)	OCWWS	6.0	Q3	In Progress
National Hydrologic Warning Council Conference and Exposition (Vail, CO, May 2009)	OCWWS	20.0	Q3	In Progress
Association of State Floodplain Managers (ASFPM) Annual Conference (Orlando, FL, June 2009)	OCWWS	7.5	Q3	In Progress
Sub Total		54.0		
Participate in AHPS Outreach with NOAA at Delaware Coast Day (MARFC, PHI); Location: Lewes, DE	ER	.3	Q1	Completed
AHPS presentation at New Jersey Association of Floodplain Managers Meeting (MARFC, HSD); Location: Cherry Hill, NJ	ER	.8	Q1	Completed
Participate in RFC/WFO partnered Flood Inundation Mapping Coordination Outreach/Meeting (MARFC, PHI); Location: TBD	ER	.2	Q1	Cancelled
Meeting with key North Carolina Reservoir Operators to review AHPS product suites and review hydrologic services (SERFC); Location: TBD	ER	.4	Q4	Moved from Q2 to Q4
High Water Mark Signs – Flood Safety Awareness Week: 10-year Hurricane Floyd Anniversary (MHX, AKQ, ILM, RAH, PHI, OKX, LWX); Location: NA	ER	1.2	Q2	Completed
AHPS presentation at New Jersey Emergency Managers Training (MARFC); Location: TBD	ER	.4	Q3	Moved from Q2 to Q3
Participate in State Water Resources Conference to promote AHPS services in State (SERFC); Location: TBD	ER	.9	Q4	Moved from Q2 to Q4
AHPS presentation at Virginia Department of Emergency Management Conference (MARFC, AKQ, RNK); Location: TBD	ER	.4	Q3	Moved from Q2 to Q3
Participate in semi-annual New York City Water Supply Meetings and review AHPS deployment and operations in the NYC water supply system. (NERFC, ALY, BGM, HSD); Location: Grahamville, NY	ER	.6	Q3	Move from Q2 to Q3
Enhanced Care Taker Program Basin Review Meeting to enhance customer relations reviewing and assessing AHPS services and requirements (SERFC); Location: TBD	ER	.6	Q4	Moved from Q2 to Q4

Participate in partnered Flood Inundation Mapping Coordination Outreach/Meeting (HSD); Location: TBD	ER	.5	Q4	Moved from Q2 to Q4
Coordination Meeting with Interstate Commission on the Potomac River Basin to review AHPS services in the watershed (MARFC, HSD, PHI); Location: Rockville, MD	ER	.5	Q3	Moved fm Q1 to Q3
National Hydrologic Warning Council (NHWC) Conference and Exposition (TBD); Location: Vail, CO	ER	.5	Q3	
Association of State Floodplain Managers (ASFPM) Annual Conference (BGM); Location: Orlando, FL	ER	.5	Q3	
Meeting with key South Carolina Reservoir Operators to review AHPS product suites and review hydrologic services (SERFC); Location: TBD	ER	.4	Q3	
Participate in WMO Sponsored-Saint John River Hydrology Committee Meeting. Share AHPS development and deployment activities in northern New England. (NERFC, HSD, CAR, BTV, GYX); Location: Halifax, Nova Scotia	ER	3.0	Q3	
Participate in semi-annual New York City Water Supply Meetings and review AHPS deployment and operations in the NYC water supply system. (NERFC, ALY, BGM, HSD); Location: Grahamville, NY	ER	.6	Q4	
Participate in State Water Resources Conference to promote AHPS services in State (SERFC); Location: TBD	ER	.9	Q4	
Local Media Workshops in New York and New England to promote AHPS services in the Region (NERFC); Locations: TBD	ER	.8	Q4	
Participate in partnered Flood Inundation Mapping Planning Meeting (HSD); Location: TBD	ER	.5	Q4	
Customer Outreach Visits in New York and New England to promote AHPS services and solicit customer hydrologic service requirements (NERFC); Locations: TBD	ER	1.0	Q4	
Sub Total		15.0		
RFC/WFO Workshop	SR	1.1	Q3	
RFC/WFO Workshop	SR	1.8	Q3	
High Water Mark Signs	SR	.6	Q4	
Lower Colorado River Authority Partners Workshop	SR	.4	Q3	
RFC/WFO workshop	SR	.2	Q3	
Upper Colorado Partners Workshop	SR	.2	Q3	
Texas Flood Plain Managers Meeting	SR	.7	Q3	
Flood Inundation Mapping Outreach	SR	.5	Q3	
Texas Hurricane Conference	SR	.7	Q3	
WFO/RFC workshop	SR	2.0	Q3	
LA, MS, TN, and AR state flood plain managers meetings	SR	2.0	Q4	
MS Water Resource Meeting	SR	.5	Q4	
GA Water Resource Conference	SR	.8	Q3	
National Hurricane Conference	SR	1.0	Q3	
State Emergency Management and Water Resource Conferences	SR	2.5	Q4	
Sub Total		15.0		
WAS*IS Workshop	CR	5.4	Q3	
High Water Mark Signs	CR	4.0	Q4	
Support activities of the SCH or SH in support of the SCH Outreach	CR	5.6	Q4	
Sub Total		15.0		

Conduct an HPM workshop at the CBRFC	WR	3.750	Q4	
Staff a booth at the Outdoor Retailers' Convention at the Salt Palace Convention Center in Salt Lake City - July 21 - 24, 2009.	WR	3.0	Q4	
Develop and print AHPS brochures for the state of Nevada.	WR	1.5	Q4	
Purchase magnets promoting WFO AHPS services.	WR	1.5	Q4	
Purchase or develop a "hands-on" watershed model. (Jayme Laber)	WR	1.0	Q4	
Purchase or develop a "hands-on" watershed model. (Jay Breidenbach)	WR	1.0	Q4	
Purchase or develop a "hands-on" watershed model.(Brent Bower)	WR	1.0	Q4	
Develop and print brochures on the Western Region Water Supply Web Page.	WR	1.5	Q4	
Partner with Ada County Parks and Recreation to promote AHPS outreach and water safety. Develop a kiosk using new and previously purchased materials.	WR	.750	Q4	
Sub Total		15.0		
Outreach material and participation in User Workshop, Anchorage, AK	AR	.525	Q3	
Participation in User Workshop, Fairbanks, AK	AR	2.0	Q3	
Participation in User Workshop, Juneau, AK	AR	2.0	Q3	
Sub Total		4.525		
Total		118.525		

Accomplishments/Actions

1st Quarter FY09

- Worked with the regions to develop the FY09 plan

2nd Quarter FY09

- OCWWS re-adjusted some of the milestones in light of The Weather Channel not in a position to assist with a DVD

Problems Encountered/Issues

1st Quarter FY09 - none

2nd Quarter FY09

- OCWWS re-adjusted some of the milestones in light of The Weather Channel not in a position to assist with a DVD

Program Management

Program Management

Theme: Program Management

Management Lead: Donna Page

Objective: Provide national program management; coordinate and track AHPS budgets and project plans; manage AHPS contracts; and foster Agency, Departmental, and Legislative Interface.

Milestones

Tasks/Subtask FY09 Milestones	Responsible	FY09 Quarter Completion Date
AHPS Planning/ Execution/ Reporting <ul style="list-style-type: none"> Quad Charts E-CPIC Updates Quarterly Status Reports 	OHD/Regions OHD OHD	Monthly Quarterly Quarterly
NOAA PPBES Hydrology Program Support <ul style="list-style-type: none"> Program Operating Plan Quad Charts Quarterly Program Review 	OHD OHD OHD	3 rd Quarterly Quarterly
Agency/ Department/ Legislative Interfaces <ul style="list-style-type: none"> Budget Fact Sheet Prepare and submit Budget Request Prepare Briefings and Support OMB/Congressional Meetings Prepare Response to Pass Back Prepare Response to Budget Hearing Questions Program Assessment Rating Tool Progress 	OHD OHD OHD OHD OHD OHD	1 st 2 nd 3 rd 3 rd 4 th Quarterly
HOSIP Process Improvement and Document Development <ul style="list-style-type: none"> Instructions Guidance & Standards Performance Statistics Quality Control Reports Gate Status Reports Validation & Recommendation Reports HOSIP Documents 	OHD OHD OHD OHD OHD OHD OHD	Quarterly Quarterly Quarterly Quarterly Quarterly Quarterly Quarterly

Accomplishments/Actions

1st Quarter FY09

- All milestones are on schedule – all scheduled reports completed

2nd Quarter FY09

- All milestones are on schedule – all scheduled reports completed

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None